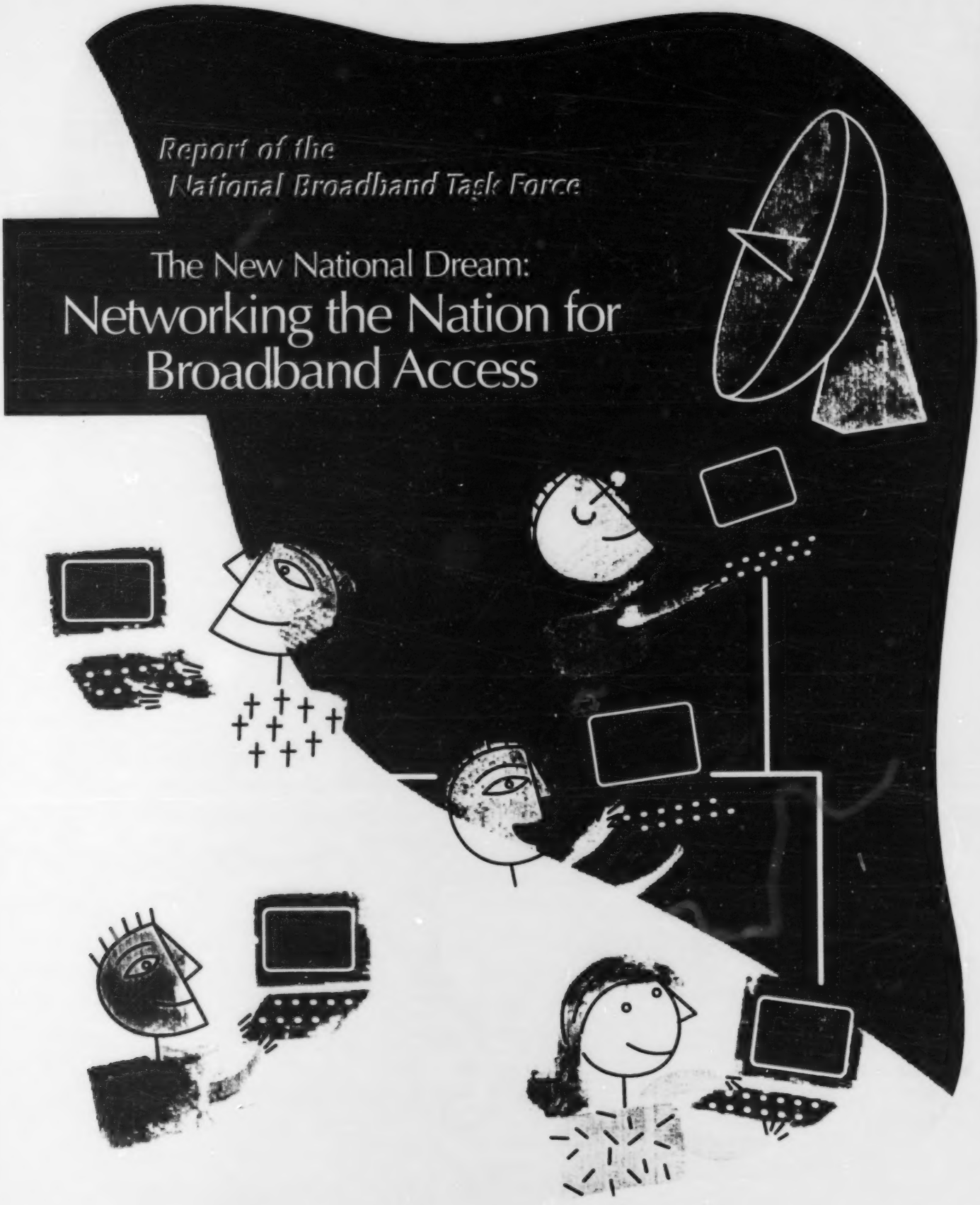
*Report of the*
*National Broadband Task Force*

# The New National Dream:
# Networking the Nation for Broadband Access



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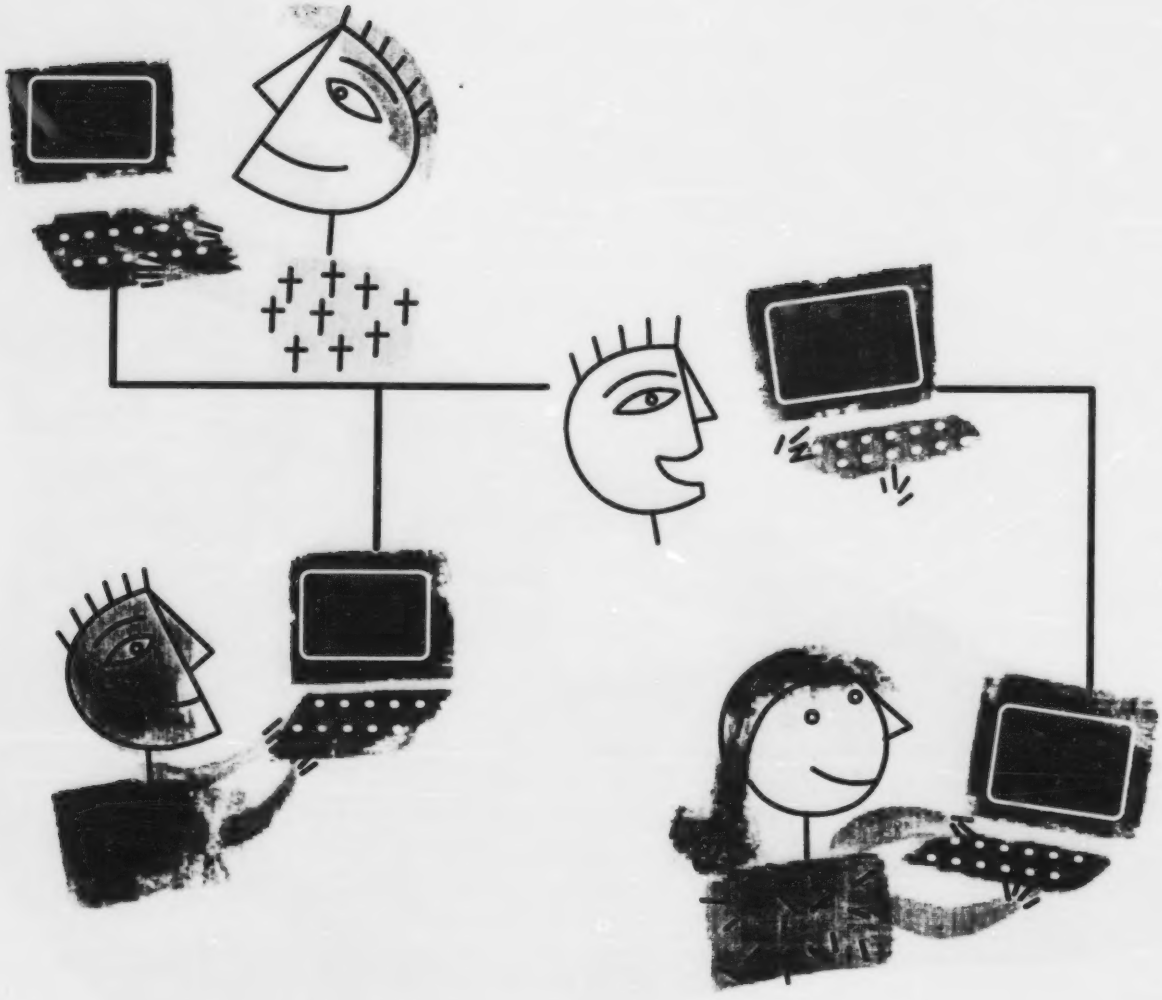

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# A Message from the Chair

The National Broadband Task Force was asked to think about the future of Canada and to make recommendations to enhance opportunity and prosperity.

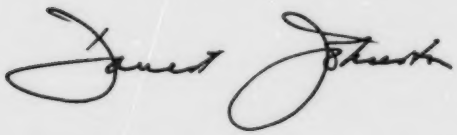
We are an eclectic group from public and private sector backgrounds, with a range of technical and content expertise but united by a desire to build a better country by absorbing and focusing ideas and experience from all our citizens. We are committed to answer affirmatively and enthusiastically that puzzle – can we have equality of opportunity and innovation and excellence too?

We concluded that Canada must seize the opportunities presented by the broadband revolution and that all Canadians should reap the benefits of high-speed Internet access. We faced a significant challenge in doing this work: we needed to picture the future against today's reality. We wanted to ensure that our recommendations set realistic and achievable goals, and yet be daring and ambitious.

The pace of work for this Task Force was similar to its subject: high speed and high capacity. We have met monthly since January 2001 with research analysis and e-mail exchanges between meetings as a constant hum.

I thank all the members of the Task Force for their unusual dedication in a punishingly short time frame. We applaud the diligent, tenacious and consistently expert work of the sherpas and Secretariat staff at Industry Canada led by Pamela Miller and served by that master weaver of rich and clear text, Don MacLean.

Finally, we thank the Honourable Brian Tobin, Minister of Industry, and his predecessor the Honourable John Manley for reaching out to citizens across the land, through us, for advice. Our message through them, to their colleagues and our fellow citizens is carpe diem and keep the completion focus of 2004.



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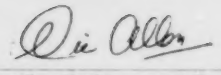

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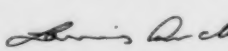

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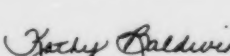

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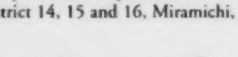

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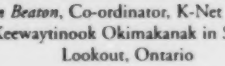

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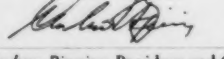

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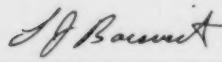

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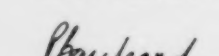

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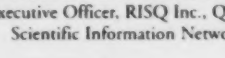

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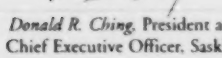

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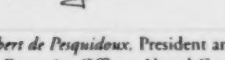

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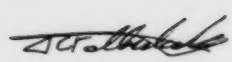

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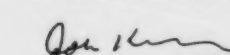

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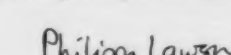

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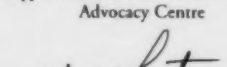

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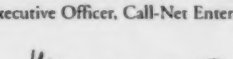

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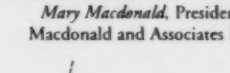

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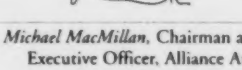

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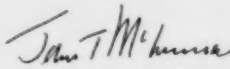

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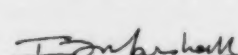

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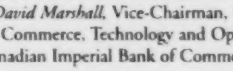

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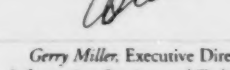

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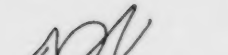

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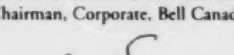

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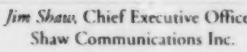

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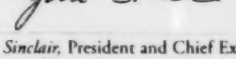

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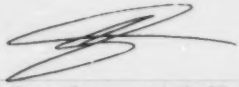

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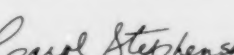

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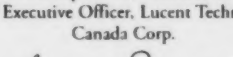

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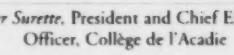

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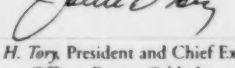

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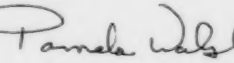

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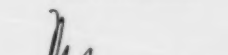

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There has long been a desire in human society for one person to be connected with another and for one community to be connected with another across all barriers of time and geography.

Today, the most advanced form of such communication uses computers and other intelligent devices, involves images, sound and text as well as the human voice and requires a form of high bandwidth interconnection called "broadband networks."

There is a growing consensus that these new forms of communication will, over time, fundamentally transform the way in which people, communities, businesses and governments interact with each other, and thus will provide opportunities for individuals to forge new relationships and lifestyles, wherever they live, and bring great social and economic value to all human kind.

The National Broadband Task Force was established in January 2001 by the Minister of Industry. The principal mandate of the Task Force was to map out a strategy for achieving the Government of Canada's goal of ensuring that broadband services are available to businesses and residents in every Canadian community by 2004. In addition, the Task Force was asked to advise the government on issues related to the development and deployment of broadband networks and services in Canada.

## What is broadband?

One of the first and more challenging tasks undertaken by the Task Force was to define the term "broadband."

Broadband was originally an engineering term referring to the amount of information that could be carried between a sender and a receiver by a communications channel, using a wired or wireless telephone network, a cable television network, a satellite network or any other kind of telecommunications network.

As the term implies, broadband networks can carry a lot of information between senders and receivers. But how much is a lot?

Modern telecommunication networks convert messages into combinations of ones and zeroes before sending them, using the same kinds of digital coding techniques as computers, CDs and DVDs. The resulting "bits" of information are then transmitted from the sender to the receiver, where they are decoded and reconverted into their original form.

To qualify as broadband, international standards organizations consider that a communications network or service must be capable of transmitting at least 1.5 or 2 million bits of information every second – or megabits per second (Mbps). However, a study of international broadband initiatives done for the Task Force found that common usage of the term "broadband" is not this precise, and ranges from a low of 200 thousand bits per second (Kbps) to as high as 30 Mbps in the 14 countries that were studied.

The Task Force believes that we are likely to see a rapid development of broadband technology, services and applications over the next few years in response to consumer demand and user requirements in the business, residential and public service sectors. Our experience over the last two decades in the development of markets for personal computers, video games and Internet access has repeatedly shown that what is considered fast today may be considered slow in six months' or one year's time, as a result of synergistic changes in technology, applications and user requirements. In our view, there is every reason to think that broadband will follow the same path.

Given these considerations, we concluded that it would not be useful to define broadband in terms of information transmission rates. We decided instead that it would be more useful to define broadband in terms of what it can do for Canadians.

There has long been a desire in human society for one person to be connected with another and for one community to be connected with another across all barriers of time and geography.

Today, the most advanced form of such communication uses computers and other intelligent devices, involves images, sound and text as well as the human voice and requires a form of high bandwidth interconnection called "broadband networks."

There is a growing consensus that these new forms of communication will, over time, fundamentally transform the way in which people, communities, businesses and governments interact with each other, and thus will provide opportunities for individuals to forge new relationships and lifestyles, wherever they live, and bring great social and economic value to all human kind.

The National Broadband Task Force was established in January 2001 by the Minister of Industry. The principal mandate of the Task Force was to map out a strategy for achieving the Government of Canada's goal of ensuring that broadband services are available to businesses and residents in every Canadian community by 2004. In addition, the Task Force was asked to advise the government on issues related to the development and deployment of broadband networks and services in Canada.

## What is broadband?

One of the first and more challenging tasks undertaken by the Task Force was to define the term "broadband."

Broadband was originally an engineering term referring to the amount of information that could be carried between a sender and a receiver by a communications channel, using a wired or wireless telephone network, a cable television network, a satellite network or any other kind of telecommunications network.

As the term implies, broadband networks can carry a lot of information between senders and receivers. But how much is a lot?

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Given these considerations, we concluded that it would not be useful to define broadband in terms of information transmission rates. We decided instead that it would be more useful to define broadband in terms of what it can do for Canadians.

**From this perspective, we concluded that we should define "broadband" as a high-capacity, two-way link between an end user and access network suppliers capable of supporting full-motion, interactive video applications.**

Broadband services that meet this standard would be able to support interactive video conferences between groups of people based at different locations in office, school and health care environments. They would be able to provide new kinds of "real time" video-based interactive entertainment services, including video games and movies on demand.

Services that meet this standard would also be able to provide a wide range of other two-way applications that require less bandwidth than full-motion interactive video. These could include improved versions of services available on the Internet today, such as home shopping, electronic banking and electronic newspapers, as well as new residential services such as video telephony.

Based on today's technology and applications, we concluded that a minimum two-way, or symmetrical, transmission speed of 1.5 Mbps per individual user is required to meet this standard. In the future, much higher speeds will be required to handle emerging applications, such as video file sharing.

## Why is broadband important?

Broadband communications are not new. Many large private and public sector organizations have their own broadband networks, and many Canadians use these networks every day at their place of work or study (e.g. if they use computers connected to a network), or as they go about their daily lives (e.g. when withdrawing cash from an ATM). In fact, experts believe that much of the economic growth that has taken place in recent years has resulted from the use of broadband networks, in combination with the Internet, to improve productivity, provide new products and services, and support innovation in all sectors of the economy.

What is new is that access to broadband communications is being extended beyond these organizational environments, in two principal directions.

- Federal, provincial, territorial and municipal governments are beginning to use broadband to improve the delivery of public services such as education and health care, and to increase the efficiency of their operations.
- High-speed Internet access services are being offered to individual households and small businesses in many Canadian communities by cable and telephone companies.

Canada is a leader in deployment of high-speed Internet access. According to a draft report by the Organization for Economic Co-operation and Development (OECD), Korea, Canada and the United States are leaders in overall broadband penetration, based on the penetration of cable modem and digital subscriber line (DSL) services to provide high-speed Internet access.

The current versions of these high-speed services offer orders of magnitude increases in transmission speed, compared to the dial-up services previously used for Internet access by these groups of customers. As such, these services are commonly considered to be broadband offerings, even though they do not conform to the definition of broadband adopted by the Task Force. However, given the rate at which broadband technology and markets are evolving, there is every reason to believe that these services will offer full broadband capability within the 2004 time frame.

In addition, the Task Force noted that a new generation of two-way, multimedia satellites will come into service within this same time frame. This development will also offer orders of magnitude improvements to the access services currently available to satellite customers, and is particularly important for residents of remote and northern communities.

The Task Force is convinced that, over the next 10 or 20 years, the development of broadband networks, services and applications will have a profound effect on all aspects of Canadian life. Broadband will transform the way we learn, the way we work, the way we use our leisure, the way we govern ourselves, the way we communicate, the way we express ourselves and the way we care for each other.

It is no exaggeration to say that over time, the impact of broadband communications on Canadian life will be at least as great as the impact of railways, highways, airlines, traditional telecommunications and broadcasting.

To a large extent, broadband communication networks, services and applications will be developed by the private sector in response to market needs and public requirements. However, even a force as powerful as broadband communications cannot repeal the laws of economics.

For the foreseeable future, in spite of continuing technological progress, the basic facts of Canadian geography and demography continue to mean that it will not be profitable for the private sector to provide broadband service in scarcely populated areas of the country. Paradoxically, however, the need for access to broadband communications is higher in these areas than in urban centres.

Why is this so?

The most revolutionary aspect of broadband is its potential to reduce greatly, and even to eliminate, distance and time as cost factors – in economic activity and in providing public services.

The Task Force found compelling evidence that there is a systemic gap between the quality of life enjoyed by Canadians living in or near the urban areas of the country and those living in rural, remote and northern areas. Similarly, there is a significant quality of life gap between Aboriginal peoples and non-Aboriginal Canadians. To a greater or lesser degree, this gap exists on every basic measure of human well-being – whether it is income, employment, educational attainment or health.

The Task Force is convinced that broadband has the potential to bridge this gap. With access to high-speed broadband services, it would be possible for a rural, remote or northern community:

- *to strengthen its economy* – e.g., by using multimedia Web sites and on-line purchasing systems to sell products and services based on the community's unique attributes and comparative advantages to regional, national and global markets;
- *to improve its health care* – e.g., by using video conferencing facilities that would allow local medical staff to diagnose illness and treat patients in real-time consultation with specialists at teaching hospitals in urban Canada; and
- *to make new learning opportunities available* – e.g., through on-line video forums linking Aboriginal students and other secondary school students from the different regions of Canada to discuss key issues of Canadian history and the current public agenda.

The Task Force is convinced that using broadband to help bridge the economic and social gaps that currently separate Canadian communities is more than a policy imperative – it is a new, national dream that could bring immense benefits to all Canadians, if we have the courage to live the dream.

- As a nation, we are committed to providing equitable opportunities to all Canadians, no matter where they live. So we *should* take advantage of broadband to help us achieve this most basic public goal.
- To compete successfully in the global environment of the 21st century, we need to recognize that the performance of our economy is interdependent with the performance of our public services – particularly our learning and health care systems.

We will only be able to maintain our world-leading quality of life if all the fundamental elements of our national life are working together, so that all Canadians have the greatest possible opportunity to achieve our potential and contribute to our success. To do this, we *must* take advantage of broadband.

## What is the size of the challenge?

Given that Canada is a leader in deployment of high-speed Internet access, what is the nature of the challenge? The Task Force terms of reference made it clear that we were to focus our efforts on developing strategies to make broadband service available to geographical communities that are unlikely to be served by market forces alone by 2004.

To do this, we had to find ways of identifying the number and location of these communities, so that we could calculate their distance from existing networks and compute the total cost of providing broadband service.

With the assistance of the telephone, cable and satellite companies represented on the Task Force, we were able to estimate that about three quarters of Canadian communities, home to about a quarter of the Canadian population, do not have access to the high-speed services currently offered by cable and telephone companies. We therefore assumed that most of these communities were unlikely to obtain full broadband service – as we have defined it – through market forces alone by 2004.

Providing broadband access to these communities by 2004 is clearly a major national challenge. Meeting this challenge will require the combined efforts of all stakeholders – governments, the private sector and the communities themselves.

## What principles should guide us?

In light of the magnitude and complexity of the broadband challenge, the Task Force thought it was important to develop a set of principles which would not only guide its work, but also serve as a point of reference for governments and other stakeholders as they seek ways and means to extend broadband service to all Canadian communities.

After considerable discussion and debate, we agreed that:

- all Canadians should have access to broadband network services so that they can take advantage of broadband opportunities wherever they live;
- the definition of broadband and related concepts should be dynamic and reflect changes in technology, applications and Canadians' requirements;
- all Canadians should have access to the social, cultural and economic benefits delivered through broadband applications;
- in addition to broadband infrastructure, access involves the parallel development of content, services, and individual and community capacity;
- all communities, institutions, businesses and individuals in Canada should have equitable and affordable access to broadband services, and to the widest possible range of content and service providers;
- communities should be engaged in planning broadband networks in light of local needs, and in building local capacity to use broadband services and content;
- the private sector should play a leadership role in the development and operation of broadband networks and services;
- governments should facilitate the deployment of broadband networks, services and content through policies and regulations that favour private sector investment, competition and innovation, as well

as by supporting communities, the creation of Canadian content and the use of broadband to deliver public services;

- publicly assisted programs to deploy broadband infrastructure to communities unlikely to be served by market forces alone should be guided by such considerations as sustainability, technological neutrality, timeliness, affordability and the value of open, competitive markets; and
- publicly assisted programs should achieve sustainable broadband access to every public learning institution, public library, health care centre and other designated public access point in the country.

## What is our recommended action plan?

In developing an action plan for ensuring that broadband services will be available to Canadian communities that are unlikely to be served by market forces alone by 2004, the Task Force drew great benefit from the counsel of a number of provinces, territories, municipalities and other communities that have already launched similar initiatives within their jurisdictions, or are in the process of doing so.

The experience of Canada's broadband pioneers provided an essential reality check for the Task Force. It helped immeasurably to point us in the right direction, as we sought to develop priorities and models for broadband deployment.

**In light of this experience and on the basis of our analysis of the broadband requirements of Canadian communities, we recommend that by 2004, broadband facilities and services should be deployed to and within all Canadian communities, according to the following priorities.**

- All Canadian communities should be linked to national broadband networks via high-capacity, scalable transport links capable of supporting an aggregate of 1.5 Mbps symmetrical service to each end user, as well as higher bandwidths to institutions.
- Access to broadband in First Nation, Inuit, rural and remote communities (including Métis communities) should be available at a reasonably comparable price to that charged in more densely populated areas.
- The local broadband access infrastructure should be extended to the community's public facilities, including every public learning institution, public health care facility, public library and other designated public access point.
- The local broadband access infrastructure should also be extended to local business and residential users, for example, by leveraging broadband infrastructure serving public facilities.

Given the great diversity of the needs and capabilities of Canada's rural, remote, northern, First Nation and Inuit communities, the Task Force quickly concluded that it would be pointless to try to design a "one size fits all" approach to implementing these priorities. However, we strongly believe that one of our key roles is to help governments and other stakeholders get on with the job of extending broadband access, by:

- identifying the core objectives that should guide publicly funded broadband deployment initiatives; and
- developing clear and practical models for partnership and co-operative action.

After examining a large number of alternative approaches, we came to the conclusion that government-funded broadband deployment models should achieve the following objectives:

- ensure third-party open access;
- ensure competitive and technological neutrality;
- ensure sustainability and scalability;
- ensure transparency in all aspects of government funding programs;
- maximize the role and risk taking of the private sector;
- leverage the financial capability of the private sector;
- minimize deployment costs;

- encourage public and private sector partnerships;
- respond to community needs; and
- build community capacity.

With these objectives in mind, we concluded that there are two main ways in which the broadband priorities we have recommended can be implemented by 2004:

- through an *infrastructure support model*, as described in this report, focused on incentives to stimulate the supply of broadband infrastructure and services, similar to the approach that has already been adopted by some provinces and territories; and
- through a bottom-up *community aggregator model*, as described in this report, focused on the stimulation of demand for broadband capabilities, similar to the approach that has already been adopted in some communities and municipalities.

In both these models open access for local service providers to broadband network facilities – including the broadband network point of presence (PoP) within a community – is a critical element.

In some cases, it may be practical to implement one or the other of these models in their "pure" form. In many other cases, however, the most practical course of action is likely to be a combination of the two – for example, to use the infrastructure support model to build a transport link from an existing national broadband network to a community point of presence, and then to use the community aggregator model to connect public institutions, businesses and residences within the community.

## What level of investment is required to implement this action plan?

To estimate the levels of investment required to implement this action plan, the Task Force developed investment models by combining data on unserved communities provided by telecommunications and cable companies with data from Statistics Canada on the characteristics of these communities, including their level of metropolitan influence.

To establish a baseline for this exercise, unserved communities were defined as communities without access to DSL or cable Internet services as of December 2000. However an assumption was made that the private sector would serve some communities that are currently unserved without the need for government funding by 2004. In addition, communities were considered served – whatever their current status – if a provincial government had already announced that it would fund service to that community (e.g. through SUPERNET in Alberta or CommunityNet in Saskatchewan).

Estimating the investments required to undertake an exercise of this scope and nature involved a number of assumptions, such as the nature and mix of technologies and the extent of the take-up of service by institutions, businesses and individuals. The resulting estimates can only provide an indication of the order of magnitude or range of investments that would be required to meet broadband deployment objectives.

It is also important to note that the proportions to be funded by governments on the one hand, and the private sector on the other, will vary considerably depending on the density and remoteness of the community, and on whether the investment in question is targeted to transport, connecting public institutions or connecting businesses and residences.

With these considerations in mind, the Task Force considered that the following estimates, which resulted from the modelling exercise, would assist the federal government in moving toward its broadband access objective, in partnership with other stakeholders.

- ***Transport to unserved communities:*** Estimates of total required investment range from $1.3 billion at the lower end to $1.9 billion at the upper end. The latter would involve a higher proportion of fibre as compared to wireless and satellite technologies.
- ***Connecting public institutions:*** Estimates are in the $500 to $600 million range, again depending on the mix of technologies.

- ***Connecting businesses and residences:*** Estimates of total required investment vary considerably, not only by reason of the nature and mix of wireline, wireless and satellite technologies assumed, but also as a function of take-up rates on the part of customers. As a result, numbers developed for the Task Force, based on DSL/cable modem wireline technologies, as well as wireless and satellite, range from $900 million at the lower end to approximately $2 billion at the upper end.
- ***Funding for community champions:*** On the basis of previous experience with public access programs, we estimated that approximately $50 to $70 million would be required.

In presenting these estimates, the Task Force wishes to emphasize that actual investment requirements can only be determined on the basis of competitive bids for specific deployment projects, and that the private sector share of these investments will be determined through competitive processes designed to capitalize on that sector's willingness to invest.

## How can we maximize the benefits of broadband for the Canadian community?

It is one thing to ensure that all Canadian communities have access to broadband networks and services. It is quite another thing to ensure that broadband serves Canada's economic, social, cultural and governance goals as effectively as possible.

*To foster innovation and encourage the use of broadband networks and services to achieve our national goals, the Task Force recommends that the federal government, and other governments as appropriate, should:*

- ensure that all Canadians have affordable access to broadband services through public access sites and by providing support for First Nation and Inuit communities, as well as for individuals with low incomes and disabilities;
- ensure that public access sites have the capacity to serve their clientele, by providing the necessary equipment, Internet access, technical support and training for staff;
- work with stakeholders and the private sector to raise awareness of the benefits of high-speed connectivity and to increase usage by individuals, communities, businesses, governments and public institutions;
- work collaboratively to create the conditions necessary for the development, retention and attraction of a Canadian work force with the education and skills necessary to ensure Canada's competitiveness in the networked economy;
- encourage the development of innovative content and services, particularly for applications in the areas of learning, health, government, culture, entertainment, community building and business;
- encourage Canadian information and communication technology (ICT) firms, particularly small and medium-sized enterprises (SMEs), to develop innovative broadband applications, focusing particularly in the areas of e-learning, e-health and e-business;
- enhance and focus federal ICT development programs and research activities on broadband technologies and applications, as well as on the basic sciences underlying both such as microelectronics, photonics and wireless;
- ensure that framework policies aimed at safeguarding a fair and efficient marketplace for both producers and consumers adequately reflect changes in the economy and the broadband environment in such areas as privacy, security, consumer protection, protection against illegal and offensive content, copyright, the legal framework for electronic transactions, the ownership of telecommunication carriers, access to rights-of-way, and open access to content and service providers; and
- leverage Canada's broadband technologies and applications strengths and success stories to build Canada's reputation as a global leader.

The Task Force recognized that investment in innovation and use of broadband networks, including innovative services, applications, technologies and content, as well as public access and individual and community capability development, is absolutely essential to capturing the economic and social benefits associated with broadband.

We did not develop specific investment models relating to our substantive recommendations in these areas, in part because the programs and initiatives through which they would be implemented are distributed across all levels of government and the private sector. Significant total investments in these areas must be made by all of these stakeholders if the goals that we have defined are to be met.

Accordingly, we recommend that the federal government provide leadership in the collective effort to respond to opportunities and needs arising from the deployment of broadband networks and services, including those also addressed by other task forces, advisory committees and roundtables, by making substantial and increasing budgetary investments through new and existing programs.

## Principles

### Overarching Principle

*We believe, as a matter of urgency, that all Canadians should have access to broadband network services so that they can live and prosper in any part of the land and have access to high levels of education, health, cultural and economic opportunities.*

### First Principle: Definition of Broadband

*The definitions of "broadband services," "broadband networks" and related concepts should be dynamic and should encompass and reflect changes in technology, applications and the needs of individuals and the potential of broadband to yield great economic and social benefits for Canadians.*

### Second Principle: Social, Cultural and Economic Benefits

*All Canadians should have access to the social, cultural and economic benefits delivered through broadband networks in such application areas as e-learning, e-health, e-government and e-business.*

### Third Principle: Capacity to Realize Benefits

*Recognizing that the primary mandate of the Task Force lies with infrastructure development, accessibility also involves the parallel development of content and services, and individual and community capacity.*

### Fourth Principle: Equitable and Affordable Access to Broadband

*All communities, institutions, businesses and individuals in Canada should have equitable and affordable access to broadband services and to the widest possible range of content and service providers.*

### Fifth Principle: Role of Communities

*Working with other stakeholders, communities should be engaged in identifying local needs and network options, in developing capacity at the local level to use and gain value from broadband networks, and in ensuring that economic development plans and initiatives incorporate broadband services and content.*

### Sixth Principle: Role of the Private Sector

*Working with other stakeholders, and operating under competitive market forces and within the evolving regulatory environment, the private sector should play a leadership role in the development and operation of broadband networks and services for Canadians.*

### Seventh Principle: Role of Governments

*Working with other stakeholders, governments should, in their respective jurisdictions:*

- *foster effective competition in facilities, services and content provision, as well as a climate conducive to private innovation and investment;*
- *develop an enabling and effective regulatory environment within which elements of the private sector operate;*
- *assist communities in exploiting opportunities for broadband deployment;*
- *ensure the effective utilization of broadband networks in such public sector activities as e-government, e-health, e-learning and e-research;*
- *stimulate the development, availability and use of Canadian content, including through Canada's public institutions; and*
- *promote awareness of Canadian achievements in the development of broadband infrastructure and use of broadband services.*

### Eighth Principle: Broadband Infrastructure Development Programs

*Government broadband infrastructure development programs in service of the specific ends described above as well as the general public interest, should focus on those communities where, without government involvement, the private sector is unlikely to deliver such services and should be guided by such considerations as sustainability, technological neutrality, timeliness and affordability, and the value of an open and competitive market.*

### Ninth Principle: Statement of Priority

*In defining broadband infrastructure development initiatives, governments should achieve sustainable broadband access to every public learning institution, public library, health care centre and other designated public access point in the country.*

### Associated Recommendation

The federal government should accept the principles articulated above as a general framework for addressing the issues identified in the mandate of the Task Force.

## Definitions

### Definition of Broadband

Based on today's technology and applications, high-speed broadband is defined as a high-capacity, two-way link between end user and access network suppliers capable of supporting full-motion interactive video applications delivered to all Canadians on terms comparable to those available in urban markets by 2004. A minimum symmetrical speed of 1.5 megabits per second per individual user is currently required to support these applications. Leading up to 2004 and beyond, new applications such as peer-to-peer file interactions and video conferencing will increase individual user demand for symmetric bandwidth in the 4-to-6 Mbps range. Public and commercial facilities will require much higher bandwidth, ranging from this minimum to several hundred times more, depending on their size and user needs.

### Definition of Community

For the purpose of the Task Force's mandate, a community can be defined as a locality which, among other things, has the following attributes: a name, a distinct physical location and territory, and a population. This definition should be used in conjunction with Statistics Canada's census data to identify communities where broadband services are unlikely to be available without government intervention.

For purposes of program implementation, it is recognized that not all communities meet these definitions and that flexibility will be required in applying these definitions, particularly considering the views of other stakeholders (i.e. levels of government).

The definition of community is geographic for purposes of defining infrastructure gaps. However, it is fully acknowledged that the application and benefits of broadband will encompass communities of interest.

## An Action Plan for Achieving Basic Broadband Access by 2004

### Overall Priorities

***Recommendation 1:*** By 2004, broadband facilities and services should be deployed to and within all Canadian communities and thus be made available to all businesses and households as well as public institutions.

***1.1 Transport link:*** All communities should be linked to national broadband networks via a high-speed, high-capacity and scalable transport link. This link should be capable of supporting an aggregate of 1.5 megabits per second symmetrical to each end user, as well as support a full range of higher bandwidth requirements to all users and institutions, regardless of location.

***1.2 First Nation, Inuit, rural and remote communities:*** The priority of the broadband deployment strategy should be to link all First Nation, Inuit, rural and remote communities to national broadband networks using appropriate technology. Further, access to broadband connectivity in First Nation, Inuit, rural

and remote communities should be available at a price reasonably comparable to that for more densely populated areas.

*1.3 Public institutions:* The local broadband access infrastructure should be extended to the community's public facilities, including every public learning institution, public health care facility, public library and other designated public access point.

*1.4 Connecting businesses and residences:* The local broadband access infrastructure should also be extended to local business and residential users, for example, by leveraging broadband infrastructure serving public facilities.

### Deployment Models

*Recommendation 2.1:* Governments should accelerate broadband deployment in those communities where without government involvement the private sector is unlikely to deliver such service, through the use of the supply-oriented infrastructure support model and the demand-oriented community aggregator model, as described in this report, or variations thereof, either independently or as complements of each other.

*Recommendation 2.2:* Governments should examine their procurement policies to ensure that these policies encourage the participation by their local offices and agencies in local demand aggregation initiatives, and take any appropriate steps to encourage and enable such participation.

### Associated Recommendation

The Task Force submits the following estimates to the federal government to indicate the order of magnitude or range of total investments that would be required to meet broadband deployment objectives by 2004 in partnership with other stakeholders. These estimates are based on a number of assumptions, and it is important to note that the proportions to be funded by governments on the one hand, and the private sector on the other, will vary considerably depending on the density and remoteness of the community, and on whether the investment in question is targeted to transport, connecting public institutions or connecting businesses and residences.

- *Transport to unserved communities:* Estimates of total required investment range from $1.3 billion at the lower end to $1.9 billion at the upper end. The latter would involve a higher proportion of fibre as compared to wireless and satellite technologies.
- *Connecting public institutions:* Estimates are in the $500 to $600 million range, again depending on the mix of technologies.
- *Connecting businesses and residences:* Estimates of total required investment vary considerably, not only by reason of the nature and mix of wireline, wireless and satellite technologies assumed, but also as a function of take-up rates on the part of customers. As a result, numbers developed for the Task Force, based on DSL/cable modem wireline technologies, as well as wireless and satellite, range from $900 million at the lower end to approximately $2 billion at the upper end.
- *Funding for community champions:* On the basis of previous experience with public access programs, we estimated that approximately $50 to $70 million would be required.

In presenting these estimates, the Task Force wishes to emphasize that actual investment requirements can only be determined on the basis of competitive bids for specific deployment projects, and that the private sector share of these investments will be determined through competitive processes designed to capitalize on that sector's willingness to invest.

## Fostering Innovation and Use

### Addressing the Digital Divide

*Equitable and affordable access*

*Recommendation 3:* Government should take leadership to ensure that affordable access to broadband services is available to all Canadians by 2004, through support for:

- public access sites;
- individuals with low income;
- individuals with disabilities and who have other kind of special needs; and
- First Nation and Inuit communities, as a matter of priority.

*Public access sites*

***Recommendation 4:*** To ensure that public access sites have the capacity to provide access to a wide clientele, governments should:

- ensure the availability, accessibility, affordability and sustainability of access to the Internet and required equipment;
- ensure technical and user support to enable public access sites to maximize their capacity to use and provide broadband services; and
- ensure training and continuous professional development for public access providers.

## Raising Awareness and Encouraging Use

***Recommendation 5:*** Governments should work with stakeholders and the private sector to raise the level of awareness of the benefits of high-speed connectivity, and increase usage by individuals, communities, businesses and all levels of government through:

***5.1 Research and pilots:*** Support for research and pilot projects that further the knowledge of the social and economic benefits of broadband, particularly in the areas of learning and skills development, health and health care, government and governance, culture and entertainment, community access and nation building, and e-commerce.

***5.2 Individuals:*** Support for information campaigns and promotion of best practices targeted toward individual citizens.

***5.3 Empowering communities:*** Support to communities, including local and voluntary organizations, local government operations, businesses and citizens working together to:

- help them define strategies to take advantage of broadband services in achieving their economic development objectives and to assist with the implementation of critical community applications;
- develop tools to help decision makers in both the community and businesses to make more informed decisions about the application of technology;
- prepare guidelines, best practices and case studies that will help all communities become "smart"; and
- develop applications.

***5.4 Encouraging business use, particularly SMEs:*** Support and training for businesses to:

- help accelerate adoption of e-business solutions, particularly among SMEs; and
- make them more aware of the critical importance and urgency of implementing broadband technology in their organizations.

***5.5 Governments as model users:*** Governments, including public learning, health and cultural institutions, should act as model users and establish and monitor specific goals for model use of broadband content and services and should provide:

- leadership in providing government services on-line, the popularization of e-governance (e.g. on-line town halls, consultations, participation in the electoral process) and the aggregation of demand through collaboration between government departments at all levels; and
- extra support to public institutions in the areas of equipment, technical support and training, where necessary in order that the benefits associated with access to broadband content and services be effectively realized.

## Support for development of necessary skills

***Recommendation 6***: Governments should work collaboratively to:

- create the conditions necessary for the development, retention and attraction of a Canadian work force with the necessary education and skills to

ensure Canada's competitiveness in the networked economy, now and in the future; and

- help users develop skills required to participate in the networked economy. This includes both learning and health service providers, as well as end users.

## Innovation in Content and Applications

*Innovation in content development*

***Recommendation 7:*** Governments should encourage the development of innovative content and services, particularly for learning, health, government, culture, entertainment, community building and e-business. Development of this content should be supported through incentives and direct funding as appropriate, through expanding the mandate of existing programs to incorporate funding for broadband content or by creating new programs.

On-line content and services should:

- reflect the social, economic and cultural perspectives of Canadians;
- respond to significant special needs of users;
- be user-centred and user-friendly; and
- be available in both official languages and in a format relevant to Aboriginal peoples.

*Innovation in applications and technology development*

***Recommendation 8:*** Innovation in applications, and the underlying technologies, are key to maintaining a strong ICT sector, required to make Canada a leader in the supply and export of broadband technologies. This can be accomplished both through support for private sector innovation and through national research and education networks.

***8.1 Applications:*** The federal government should establish a broadband applications development program aimed at encouraging Canadian ICT firms to develop innovative applications for broadband networks, focusing particularly in the areas of e-learning, e-health and e-business. Care should be taken to ensure that such programs encourage SME participation.

***8.2 Research:*** The federal government should identify ways in which current technology development programs, as well as the work of federal labs and federally supported research activities can be enhanced and focused so as to contribute more effectively to developing the innovative potential and competitiveness of Canada's ICT sector. Priority should be placed on the areas of broadband technologies and applications, as well as on the basic sciences underlying both, such as micro-electronics, photonics and wireless.

## Government Leadership

*Creating an enabling policy and regulatory environment*

***Recommendation 9:*** Government should ensure that framework policies, which safeguard a fair and efficient marketplace for both producers and consumers, adequately reflect changes in the economy and the broadband environment. Further, the policy and regulatory environment governing the telecommunications sector should recognize the pace of technological change and create conditions which promote competition, innovation and the deployment of high-speed networks.

***9.1 Information policy:*** Governments should continually review regulations and practices in the areas of privacy, security, consumer protection, protection against illegal and offensive content, copyright and the legal framework for electronic transactions in cases where it is clear that market forces are not providing adequate direction.

***9.2 Foreign investment:*** To ensure that a maximum amount of capital is made available to finance the expansion of broadband access and to ensure that all industry participants are in a position to partner with government in facilitating broadband deployment, the federal government should conduct an urgent review of foreign investment restrictions for

telecommunication common carriers and distribution undertakings with a view to determining whether they are currently restricting or are likely to restrict increased industry participation in the competitive deployment of broadband infrastructure in Canada. This review is only intended to include restrictions on foreign investment in telecommunication common carriers and distribution undertakings.

***9.3 Capital recovery:*** The Canadian Radio-television and Telecommunications Commission (CRTC) should ensure that its decisions, in matters which affect revenues, reflect the particularly heavy demands and challenges facing facilities providers in terms of capital generation and capital recovery.

***9.4 Rights of way:*** All levels of government should examine rights-of-way issues to ensure that they do not serve as a barrier to broadband deployment.

***9.5 Access to content and service providers:*** Government policy and regulation should foster the widest possible access to content and service providers, with a view to enabling consumer choice.

*Branding Canada*

***Recommendation 10:*** The federal government should leverage Canada's broadband technologies and applications strengths and success stories to build Canada's reputation as a global leader.

## Associated Recommendation

The Task Force recognized that investment in innovation and use of broadband networks, including innovative services, applications, technologies and content, as well as public access and individual and community capability development, is absolutely essential to capturing the economic and social benefits associated with broadband.

We did not develop specific investment models relating to our substantive recommendations in these areas, in part because the programs and initiatives through which they would be implemented are distributed across all levels of government and the private sector. Significant total investments in these areas must be made by all of these stakeholders if the goals that we have defined are to be met.

The Task Force recommends that the federal government provide leadership in the collective effort to respond to opportunities and needs arising from the deployment of broadband networks and services, including those also addressed by other task forces, advisory committees and roundtables, by making substantial and increasing budgetary investments through new and existing programs.

## Overall Associated Recommendation

As the federal government prepares to respond to the Task Force report, it should seek views from partners at all levels on how recommendations should be implemented.

## NATIONAL BROADBAND TASK FORCE RECOMMENDATIONS

### ACTION PLAN FOR BASIC BROADBAND ACCESS

1. **Overall Priorities**
   - 1.1 Transport link
   - 1.2 First Nation, Inuit, rural and remote
   - 1.3 Connecting public institutions
   - 1.4 Connecting businesses and residences
2. **Deployment Models**
   - 2.1 Models
   - 2.2 Role of government procurement

### ADDRESSING THE DIGITAL DIVIDE

3. **Equitable and affordable access**
4. **Public access sites**

### RAISING AWARENESS AND ENCOURAGING USE

5. **Awareness and use**
   - 5.1 Research and pilots
   - 5.2 Individuals
   - 5.3 Empowering communities
   - 5.4 Encouraging business use
   - 5.5 Governments as model users
6. **Support for development of necessary skills**

### INNOVATION IN CONTENT AND APPLICATIONS

7. **Innovation in content development**
8. **Innovation in applications and technology development**
   - 8.1 Applications
   - 8.2 Research

### GOVERNMENT LEADERSHIP

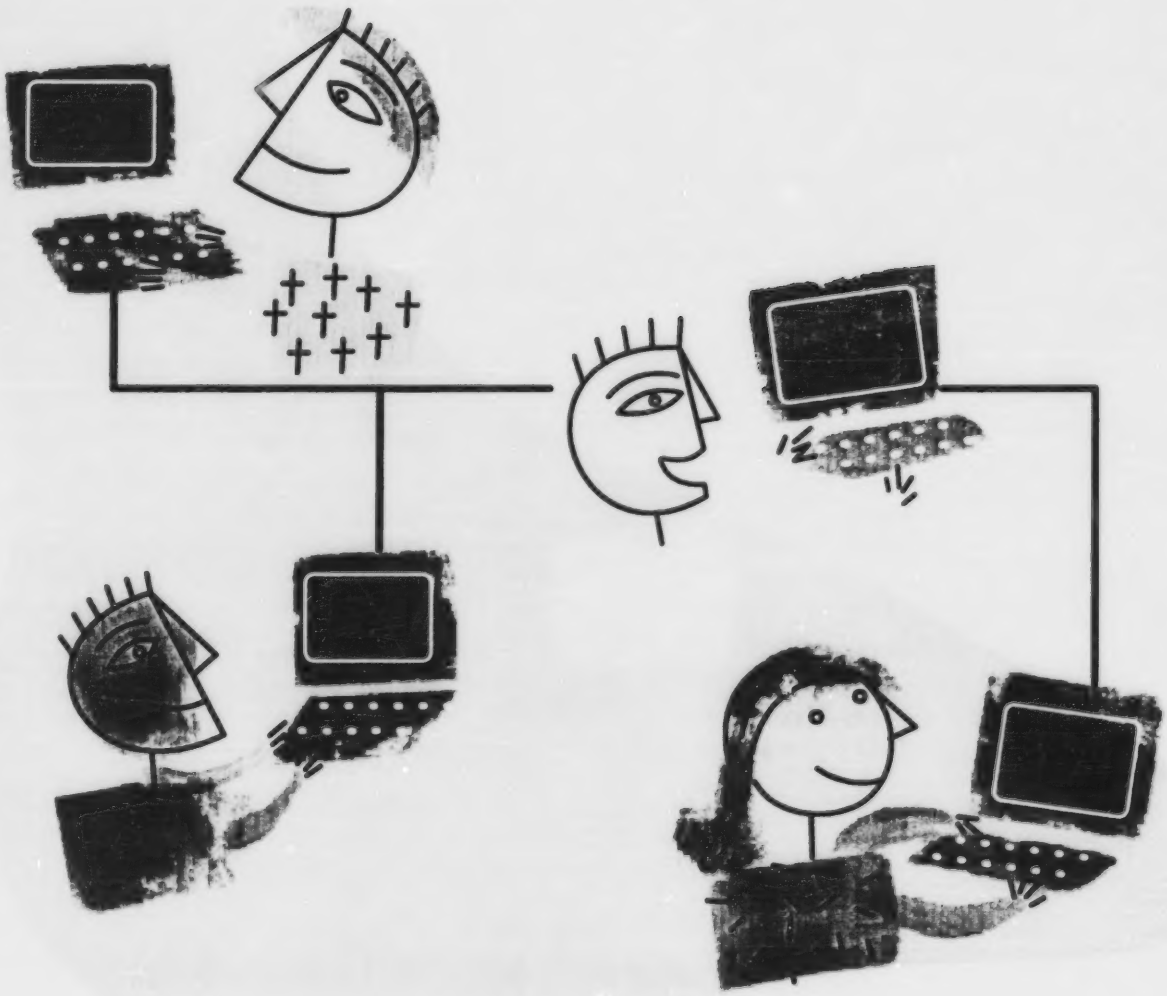
9. **Creating an enabling policy and regulatory environment**
   - 9.1 Information policy
   - 9.2 Foreign investment
   - 9.3 Capital recovery
   - 9.4 Rights of way
   - 9.5 Access to content and service providers
10. **Branding Canada**

### ASSOCIATED RECOMMENDATIONS

1. **Accept principles as framework**
2. **Consider investment estimates**
   - broadband deployment
   - innovation and use
3. **Seek views from partners on implementation**

## *Part One:*

# Nation Building in a Broadband World



***This report is about a revolution that is under way in communications technology, a revolution that has the potential to eliminate distance and reduce time as factors in human life. Fundamentally, therefore, it is about a technological revolution that will affect the way we live, our place in the world and our relations with each other – for better or worse.***

We are in the early stages of a broadband revolution and, like every revolutionary movement, the ground has already been prepared.

The broadband revolution has not sprung fully formed from the minds of engineering genius. It builds on three fundamental changes that have taken place in communication networks over the last quarter century.

- The *digital revolution* has enabled all forms of message (written text and numbers, sounds, pictures) to be coded in the digital language used by computers and divided into packets of information which can be taken apart when they are sent into a communications channel and reassembled at the other end, instead of being coded as continuous variations in electromagnetic waves that are analogous to the words, sounds and pictures being communicated.
- The *network revolution* has taken advantage of the digital revolution to transform networks from single-purpose creatures designed to carry only one kind of message (voice, text, sound, pictures) between single-purpose terminals (telephones, fax machines, radios, televisions) into multi-purpose creatures designed to carry any kind of message between multimedia terminals which are based on computerized intelligence, whatever their outward appearance.
- The *capacity revolution* has resulted in the development of new communications media (optical fibres, high-frequency radio-communication bands) that can carry vastly greater quantities of information, as well as innovative network architectures and improved coding techniques that are able to reduce greatly the amount of information that has to be communicated to send a message.

Taken together, these three revolutions underlie the convergence and competition that is now taking place between three formerly distinct business – telecommunications, broadcasting (including cable) and computer-to-computer communications, represented by the Internet.

## 1.1 Broadband Networks: Technology and Markets Today

Today, high-speed broadband commonly refers to a high-capacity two-way link between an end user and an access network supplier capable of supporting real time data rates in the ***megabits per second*** (Mbps) range. These data rates can support most of today's business and home multimedia applications.

A desirable capability in the near term would be ***symmetrical megabits per second***, which is needed to support emerging applications such as peer-to-peer file interactions, machine-to-machine communications and two-way, full-motion interactive video.

There is already an immense amount of broadband communication capacity in Canada and around the world, installed in large companies and public organizations. Many Canadians routinely use broadband communications at work.

- Most of today's Internet core networks or backbones can support data rates in the gigabit (1000 megabits) and even terabit (1 million megabits) per second range. By some estimates, core network capacity is doubling every six months and the capacity of long-haul networks across North America and Europe will therefore increase dramatically in the next five years. At the same time, the demand for bandwidth is increasing as rapidly as networks are being built. A report by American Telegraph & Telephone (ATT) predicted the volume of data sent over the Internet will approximately double each year for the next decade (resulting in a 1600 percent increase by 2005).
- Many commercial and institutional facilities such as hospitals and school boards today have access to gigabit per second (Gbps) data rates through

municipal Ethernet networks. All of these networks run over common single mode fibre connected to the provincial and national backbone through a neutral point of presence.

In addition to large organizations and institutions, a growing number of small businesses and residents use broadband for high-speed Internet access.

- On the local access side, there is a growing range of broadband-graded Internet access technologies, such as coaxial cable (television), digital subscriber line (DSL), optical fibre, fixed wireless and future 3G mobile. These technologies can deliver Mbps **data rates** to end users depending on such factors as distance from the nearest central office switch (CO), network configurations and the number of concurrent users. In addition, next generation broadband two-way multimedia satellites, expected to be available over the next three to four years, promise to improve access by several orders of magnitudes compared to today's service. This is a particularly important development for remote and northern communities.

Broadband technology, *per se*, is not a significant problem. The challenge for network suppliers is to optimize the performance of their access technologies in a cost-effective manner to meet demand for more capacity at reasonable prices.

This problem is more acute in small rural and remote communities where facilities capable of supporting high-speed broadband access are either woefully inadequate or non-existent. In the absence of regional or local network suppliers, communities themselves must either take steps to attract suppliers or, alternatively, develop their own connectivity solutions.

Governments can do much to reduce or eliminate these problems by fostering a competitive environment in high-density markets, by leveraging competitive forces where appropriate and by providing direct incentives to encourage private sector investment in high cost areas.

Human infrastructure is at least as important as physical infrastructure to enable communities to take full advantage of broadband technology and to negotiate the best possible connectivity solutions with suppliers. Government assistance should focus on the development of the appropriate skills to maximize the social and economic opportunities and benefits of broadband connectivity within the community.

In the medium term, we believe that the Internet access infrastructure will be optimized by the private sector to deliver Gbps or Mbps capacity to institutions, businesses and residential users where reasonable rates of return can be realized.

However, in higher cost areas, such as low-density, rural and remote communities, government incentives will be required to achieve and maintain equivalent affordable levels of service. In areas where satellite is the only possible connection to the Internet, next generation multimedia satellites will provide much faster access than today's services at comparable prices. These technologies can also be optimized to support high-bandwidth applications on demand to remote educational and health institutions. However, the high monthly cost of these services may be a concern.

## 1.2 The Benefits of Broadband: Making a Difference Tomorrow

How will broadband communications be used to improve the performance of our economic, social and cultural systems? What will broadband bring that we do not already have?

In this section we attempt to provide the beginning of an answer to these questions by imagining how the broadband revolution will transform communications-based applications and services that are already familiar to many Canadians in four key areas:

- e-business;
- e-learning;
- e-health; and
- e-content.

This is by no means intended to be an exhaustive list of application areas that will be transformed by the

### *E-Government in Yellowknife*

The City of Yellowknife has established a unique Web site offering a wide range of on-line services. At Yellowknife's Web site, you can register a business, obtain a lottery licence, pay a parking ticket or book a public facility, such as a local rink or a meeting room. It is possible to find – at any time of day or night – municipal information that would otherwise require time and perseverance to obtain by more traditional means. The Web site contains features such as news updates, the full text of by-laws and telephone directories. Through a project called CityNET, Yellowknife is preparing to offer citizens information through an interactive computerized phone system and an interactive version of cable television, building on an interactive voice response service begun in 1996. This project is a component of the Smart Communities initiative in Yellowknife. Ultimately this approach will create a forum for residents to discuss and debate local issues.

### *Technology Initiatives for Deaf and Hard of Hearing People*

Across northern Ontario, the Canadian Hearing Society will be initiating several projects using broadband in an interactive Internet-based service to support educational, employment and communication opportunities for people who are deaf, deaf-blind and hard of hearing. For the first time ever, deaf people in remote areas will have a link to the resources they need, in real-time face-to-face meetings. Through information processing (IP) video conferencing technologies and integrated services digital network (ISDN) lines, deaf customers, as well as hearing staff and support workers, will be able to work or learn with the help of simultaneous transmission of sign language (ASL-LSQ). For deaf and hard of hearing individuals, there will be access to note taking and captioning when sharing documents over the Internet. Still, a high level of bandwidth is necessary to ensure that consumers clearly understand what is being signed or speechread (speed of 384 kilobits per second, or Kbps). The advanced technologies will help bridge the enormous gaps in communication which currently exist for people who are deaf or deaf-blind. Deaf people in remote regions will have access to the full scope, scale and expertise available.

broadband revolution – only an initial survey of the changes that can be forecast with some degree of certainty in sectors that have already been relatively deeply penetrated by the Internet and other advanced communication technologies.

Although we have not attempted to do so, we think it would be well worthwhile to examine the potential impact of broadband communications in two other high priority areas.

- We think it is likely that broadband will have a very significant impact on governance – i.e., on the operation of our political system, on the delivery of public services and on the relationship between government, the private sector and civil society – at every level from community to municipal to provincial to federal to global. We have noted that the federal government's Government On-Line (GOL) project aims to address at least some of these issues in the same time frame as it intends to extend broadband access to all Canadian communities, and that GOL applications are an important element of provincial and territorial broadband deployment initiatives.
- We also think it is likely that broadband will have potentially enormous consequences for our cultural institutions, the non-electronic media and traditional forms of cultural expression. This is an area of inquiry so vast and so important to our country's future that it may merit examination in its own right, perhaps along the lines of the reviews that have recently been undertaken of e-commerce, e-learning, e-health and e-government.

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the kind used for electronic data interchange and debit and credit card transactions. These two kinds of transactions are often referred to as business-to-business (B2B) and business-to-consumer (B2C) e-commerce. According to International Data Corporation (IDC) Canada Ltd., B2B transactions represented 87 percent of the e-commerce market in Canada in 1999, while B2C accounted for the remaining 13 percent.

In this report, the more encompassing term "e-business" will be used to refer to both e-commerce transactions and other uses of networks, to conduct and co-ordinate business operations between organizations and their suppliers and customers.

In this perspective, government transactions with citizens, business and organizations also fall within the e-business category, as do the activities of virtual organizations and communities of interest enabled by the Internet.

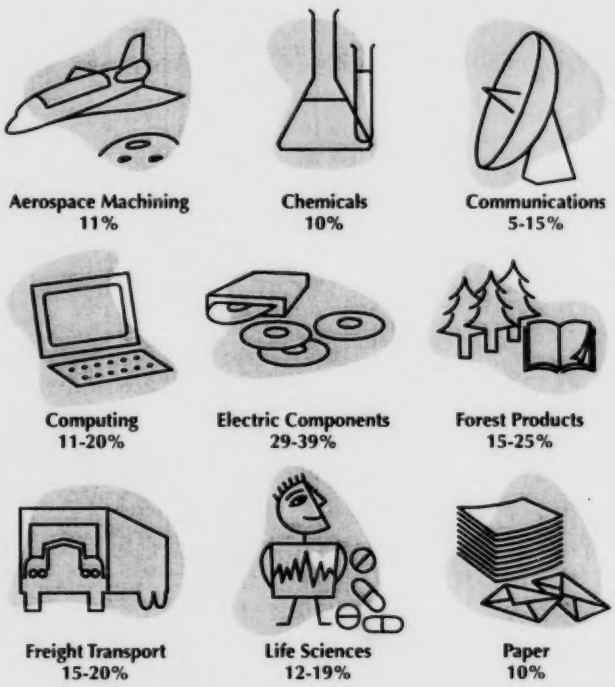
## E-business today –

According to Statistics Canada's second annual economy-wide survey on e-commerce and information and communication technology (ICT) use, the total value of private sector sales over the Internet with or without on-line payment, rose dramatically in 2000. Canadian business received $7.2 billion in customer orders over the Internet in 2000, up 73 percent from 1999. This is a significant transformation of how business is being conducted. The Statistics Canada survey results indicate, however, that e-business adoption and use is concentrated in a few key sectors of the economy such as manufacturing, wholesale and retail trade, transportation and warehousing. This supports the assessment made by the Canadian E-Business Roundtable in its February 2001 report, that there continues to be a lack of business adoption of e-commerce, especially among small and medium-sized enterprises (SMEs) and certain sectors.

**FIGURE 1**
**Estimated Savings of B2B E-Commerce**

"...the real power of the Internet will be felt in the existing, or 'old', economy, which we project will make increasing use of the Internet to deliver benefits to consumers."

*Source: "The Economy and the Internet: What Lies Ahead?", December 2000 by Robert Litan and Alice Rivlin, Brookings Institute.*




*Source: Goldman Sachs, January 2000.*

Improved supply chain management, along with the development of e-markets, promises sharply reduced procurement costs for corporate customers and sharply reduced distribution cost for suppliers. As argued by Goldman and Sachs (see Figure 1), savings resulting from B2B e-commerce in different sectors can be very important. Canadian firms in many industry sectors, however, are still not ready to embrace the challenge of co-ordinating their e-business strategies to allow development of the standards and common approaches demanded by e-markets.

***Electronic auctions***

An electronic auction site for cattle, created by the Quebec cattle producers federation, allows slaughterhouses to purchase grain-fed calves and beef cattle directly on-line; 60 percent of beef cattle are now sold at electronic auction in Quebec. The selling cost for the producers of grain-fed calves has dropped from $11 to $4.50 a head, and the animals do not have to be shipped twice, first to the auction sale and then to the slaughterhouse [translation].

**"De l'encan de la ferme aux enchères électroniques dans Internet." Sylviane Beauregard and Jean Talbot.**

The possible explanations for this phenomenon are numerous. One critical issue is the lack of dominant corporate "customers" in Canada. In the United States, many e-markets have developed because of the catalytic actions of a few large buyer organizations.

There can be little doubt that the development of robust e-markets in every sector of the economy and among firms large and small will sharply increase the demand for very high-speed networks among businesses. This demand will be evident not only in cities but in rural and remote areas whose businesses can be expected to benefit the most from the capacity of e-business to reduce their distance from markets and from centres of economic activity. It is also at least arguable that the comparative lack of very high-speed connections may have retarded the development of e-business in Canada.

## B2C e-business –

As noted above, only 13 percent of the e-commerce transactions in Canada occurred between businesses and consumers. Simply put, the market for B2C e-commerce has been relatively slow to develop. There are many reasons for this. One of the most important appears to be security concern on the part of Canadian buyers. Another may be that consumers require a much more compelling offering than is currently available. Yet another might be that the infrastructure to support the kind of e-business interaction that customers are looking for is not yet widely available.

However, the impact of on-line services to consumers is much more pervasive and significant if we consider that many B2C e-business services are now routinely being conducted on-line. In 2000, according to Canadian Facts, more than 20 percent of Canadians use Web-based banking, and e-business will continue to transform how we get our news, how we enroll at a university, how we research major purchases, how we get product support and the many other B2C services that are not included in our measures of e-commerce.

Whatever the other factors contributing to the slow take up of B2C e-commerce, there can be little doubt that network response times can be a severe problem. According to Nortel, people wasted an estimated 2.5 billion hours on-line last year, waiting for pages to download. Research has shown a typical e-business patron's attention span is about eight seconds. Years before the Internet, studies conducted by IBM showed that anything slower than "sub-second response time" interfered with a user's train of thought and undermined the value of on-line transaction processing. Presumably the same observation holds true when the transaction is over the Internet.

## E-business tomorrow –

High-performance broadband networks would help address the "worldwide wait" syndrome, although achieving IBM's "sub-second response time" goal might be some years off. Such networks will also be critical to support small businesses offering services to the growing e-business market.

High-performance broadband connections will also allow a number of key applications that could render the e-business experience more appealing to consumers, including these, among others.

- ***Integration of telephony, voice recognition and data environments:*** Several new e-business applications are emerging to take advantage of the possibility of integrating voice and data environments. Responding to customers with the human voice in real time, as well as pictorial, graphical and transaction displays, could well be what it takes to bring customers on-line. For consumers to take advantage of such integration in a seamless way, broadband connections to the home will be necessary.
- ***Virtual reality:*** Because of today's relatively low-bandwidth connections, e-retailers must rely on a series of symbols, scroll bars, textual instructions and other devices to communicate with e-shoppers. With high-bandwidth connections to the home, it would be possible to begin to create an environment that the shopper experiences as being more like a store.
- ***Internet appliances:*** The next few years will see the deployment of massive numbers of Internet "appliances" – cell-phones and a wide range of devices embedded in cars, homes, kitchen appliances, transportation systems, vending machines and so on. Ubiquitous high-speed networks will be necessary to handle the growing demand for bandwidth that these appliances will generate.

The economic benefits of e-business will eventually pervade the entire economy and include the following results.

- ***Improved market and organizational efficiency:*** Many experts believe information technology can boost efficiencies throughout the economy and in everything we do. By increasing access to information through implementation of on-line versions of business processes and transaction management, the Internet and e-business can make all organizations and markets work more productively.
- ***Speeded up innovation:*** By rendering it easier and cheaper to process large amounts of data and reducing the time it takes to design new products, information technology can speed up innovation.

### *Farm management tool of the future*

The ability to get timely information on a daily basis can make the difference these days between farming profitably and finding another way to make a living.

That's the opinion of Bruce Oliver, policy officer with the New Brunswick Federation of Agriculture, who designed a six-hour course to help farmers and their spouses learn the ins and outs of operating a computer and connecting to the Internet.

The course was offered throughout the province at Community Access Centres, set up under Industry Canada's Community Access Program (CAP). CAP is designed to help Canadians in communities across the country acquire and use new information technologies as a means for social, cultural and economic development. The course, attended by approximately 40 people, was delivered through ConnectNBBranché.

"The farming community these days is very aware that access to timely information – on weather conditions, fuel costs or commodity prices – is what makes or breaks a farm operation," says Oliver.

Many people involved in agriculture see the Internet as the farm management tool of the future. The intent of the course was to help the community get ready.

"We designed the course to make people feel comfortable with the technology, to help them develop the confidence that they won't destroy the Internet just by logging on," says Oliver.

The Federation plans to offer the six-hour course again, and would eventually like to offer training courses on the Net. "We've gone into communities to give courses on pesticide certification," says Oliver. "It's inevitable that we will eventually do the same kind of training over the Internet."

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- ***Improved market and organizational efficiency:*** Many experts believe information technology can boost efficiencies throughout the economy and in everything we do. By increasing access to information through implementation of on-line versions of business processes and transaction management, the Internet and e-business can make all organizations and markets work more productively.
- ***Speeded up innovation:*** By rendering it easier and cheaper to process large amounts of data and reducing the time it takes to design new products, information technology can speed up innovation.

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The course was offered throughout the province at Community Access Centres, set up under Industry Canada's Community Access Program (CAP). CAP is designed to help Canadians in communities across the country acquire and use new information technologies as a means for social, cultural and economic development. The course, attended by approximately 40 people, was delivered through ConnectNBBranché.

"The farming community these days is very aware that access to timely information – on weather conditions, fuel costs or commodity prices – is what makes or breaks a farm operation," says Oliver.

Many people involved in agriculture see the Internet as the farm management tool of the future. The intent of the course was to help the community get ready.

"We designed the course to make people feel comfortable with the technology, to help them develop the confidence that they won't destroy the Internet just by logging on," says Oliver.

The Federation plans to offer the six-hour course again, and would eventually like to offer training courses on the Net. "We've gone into communities to give courses on pesticide certification," says Oliver. "It's inevitable that we will eventually do the same kind of training over the Internet."

- ***Lowered entry barriers:*** E-business can also lower the barriers to market entry for small and medium-sized enterprises by making it easier for them to reach out to global markets through international network connections via the Internet.
- ***Reduced distribution and procurement costs:*** E-business can sharply reduce a firm's procurement costs by, for example, enabling just-in-time delivery. Distribution costs can also fall, because better information allows for improved co-ordination and linkages across supply and retail chains, thereby reducing the need for large inventories and creating other opportunities for improved productivity. Moreover, there can be a very positive impact on distribution costs if a product or service offering – such as software, a financial service or music – can be distributed digitally over the Internet.
- ***Accelerated outsourcing, virtualization and productivity improvements***: E-business and the Internet can also support and accelerate outsourcing and the use of virtual organizations. Outsourcing to companies with specific expertise or scale advantages can lead to productivity improvements and cost savings.

For these reasons and more, e-business is increasingly viewed as crucial to the development of national economies.

E-business is also critical to the development and diversification of regional economies that have hitherto been at a disadvantage because of their remoteness. As we have argued above, and as practical experience in Canada and other countries has already demonstrated, knowledge and the ability to communicate effectively will be the twin foundations of economic growth and prosperity in the networked economy of the future. By reducing or even eliminating the economic costs traditionally associated with distance, broadband communications offer all Canadian communities the potential to capitalize on their natural and human endowments, and to compete effectively in markets of whatever scale in their areas of comparative advantage.

"Lifelong learning in an e-environment will require Canada and its post-secondary institutions to become aggressive providers of first rate e-content that reflects not only Canada, but the best international information that the world provides. Courses relating to Canadian social science and cultural issues, for example, need to be supported by significant collections of Canadian e-books and primary sources. E-courses in the sciences, engineering and business need to be supported by the best digital content available in the world."

***Frits Pannekoek, Director, Information Resources, University of Calgary***

## E-Learning

E-learning, or on-line learning, can be defined as what occurs when education and training are delivered and supported by networks, in particular by the Internet. Defined in this way, the label can be applied to both public sector and private sector activity, to any level in formal educational programs or to training, to all or only parts of courses and programs, and to both distance and on-site learning situations. Broadband technologies and applications make a wide range of both formal and informal learning opportunities more accessible for all learners, regardless of subject or location.

## E-learning today –

*On-line learning and educational institutions*

According to Campus Computing International, as of spring 2000, 57 percent of Canada's colleges and universities together offered almost 3000 on-line courses. In addition, there is a large and rapidly growing commercial market for training services offered by the private sector.

To share the costs of on-line learning, Canadian institutions are increasingly entering into alliances and consortium arrangements. Examples include the

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Canadian Virtual University and the Consortium of Higher Education Research Universities. Provincial and territorial governments have also launched a significant number of initiatives to support on-line learning at all levels.

Of special significance, perhaps, has been the encouragement and support of the federal government through the SchoolNet program. Together with the efforts of the provincial and territorial governments, the educational community and the private sector, this initiative helped to make Canada the first country in the world to connect all its public schools and libraries to the Internet.

Despite these achievements and activities, few on-line courses exploit higher bandwidth. Most course offerings are designed for use with the comparatively low bandwidth available with dial-up access to the Internet. While representing an improvement over the old correspondence courses of the past in terms of keeping students motivated, these low-bandwidth courses barely scratch the potential of e-learning.

That potential must be exploited to ensure enough skilled workers in Canada to meet growing demands. Canada is facing a skills shortage in many sectors. The Canadian Federation of Independent Business recently estimated there are 300 000 unfilled skilled jobs in small and medium enterprises. The Conference Board of Canada has forecast that there could be a shortage of one million skilled workers by 2020 if current trends continue. Already, the construction industry has identified a shortage of tradespeople and the information-technology sector lacks software developers.

*On-line learning and libraries*

The public library is an integral part of the community's learning system. Canadians make more than 150 million visits to public libraries annually – attendance that far outstrips all cultural and sporting visits combined. According to Ekos Research, two out of three Canadians are active members of their public library.

The Internet enables the small local community library, once limited by the small number of items on its own shelves, to be the point of entry to the world's libraries. Community size or location is no longer the huge limitation it used to be.

Canada was the first country in the world to have every public library connected to the Internet, and studies have shown that public libraries remain the preferred venue for public Internet access and training in "digital literacy" – a major means of mitigating the digital divide.

This public access is used not just by people with low income lacking home access, but also by people who require faster Internet access speed or more powerful computers than they have at home, people who are fed up with hours of searching for something a reference librarian can find in a few clicks, families with several children needing access for school projects in the evening, or people who want help with complex searches or transactions such as e-filing an income tax return.

Once thought to be a limited or transitional measure, public access in public libraries is now understood to be a continuing core requirement of e-learning strategies.

## E-learning tomorrow –

*Broadband and educational institutions*

According to a recent study, effective e-learning should have the following characteristics:

- an expert-rich content and curriculum;
- flexibility and convenience;
- continuous assessment, real-time feedback, tracking and metrics;
- multimedia simulations, rich case studies and threaded discussions; and
- a dynamic engaging environment for learning.

In addition to the basic elements identified in this study, a *comprehensive* learning environment would have many additional elements.

Effective e-learning requires the right kind of learning material. Perhaps the most challenging part of developing such material is the merging of appropriate multimedia elements – images, animations, video clips, simulations and so on – with the pedagogical context appropriate to the defined objectives for the e-learning course or course component.

The model of this approach to e-learning refers to these distinct elements as "learning objects," with course units or modules being constructed around numerous such objects, usually in addition to more traditional learning materials.

The construction and use of "repositories" of such learning objects provides a specific example of how broadband networks will support e-learning. A course developer can then draw on these elements to create a course or a part of a course. Under this model, the repository would normally come equipped with easy-to-use interfaces for both course developers and students, and a set of "tools" to allow construction of course modules around the learning objects and even to evaluate student performance and manage the course.

Given the multimedia and interactive nature of the learning objects, course developers and students will generally need very high bandwidth access to the repositories. If the repository is on a server inside an institution or school, and the students are expected to be on-site when accessing it, then it will be sufficient to have an internal network of very high bandwidth, perhaps up to one Gbps or higher. If the students are at remote locations, their personal access will have to be in the 10 Mbps range.

Because e-learning can significantly improve both accessibility to, and the quality of, the learning experience, its economic and social impacts can be profound.

- In a knowledge-based society, human capital is the main source of competitive advantage. E-learning represents a key means for advancing education at every academic level, and for enabling lifelong learning.
- Development and *maintenance* of critical skills through professional upgrading is becoming increasingly important to the success of individuals, companies, communities and national economies. E-learning can be a cost-effective means of providing such services, especially to remote locations.
- Many adults have family and job commitments that prevent them from attending a traditionally scheduled class. E-learning in the home may represent their only opportunity to take courses.
- Many of the skills needed by knowledge workers, such as the ability to conduct research and manage projects, are becoming increasingly dependent on computers and the Internet. E-learning can readily integrate the development of those skills into the learning environment itself.

*Broadband and libraries*

Among the most frequent uses of public library access are:

- "how-to" information on a range of topics running from small business start-up to home repair;

### Public Access in PEI Libraries

Citizens of PEI now have free access to the proprietary "Infotrac" suite of data bases through the Internet access program of their public library system. The Provincial Library of Prince Edward Island has secured a provincial licence for all library members to get learning, health, business, consumer and household information. From plans for a table saw sled to summaries on mutual funds, this puts a wealth of information in the hands of all citizens with library cards, accessible from home, work or library.

The success of public Internet access programs is nowhere more apparent than in PEI. Citizens there booked 45 000 one-hour Internet sessions in the province's 25 public libraries, of which 20 are rural.

- career planning, preparation and job search;
- consumer health;
- distance learning;
- leisure support;
- government information;
- literacy support; and
- heritage language applications.

Broadband access will strengthen the range and accessibility of these and other applications through public libraries as a result of its capacity to deliver video applications, improve overall speed of access and handle large volumes of users with similar information or transaction needs.

Broadband applications in literacy support alone have the potential to make a huge impact on a problem of serious dimensions for Canada. This is particularly the case in isolated communities, where small community libraries managed by dedicated but poorly supported volunteers currently have few convenient and attractive resources to draw upon for literacy support.

## E-Health

"Tele-health" involves the use of information and communications technology to deliver health care, health education and health information over large and small distances. There are many sub-sets of tele-health, such as "tele-medicine," "tele-radiology," "tele-consultation," "tele-homecare" and so on.

All these concepts, most of which are comparatively easy to understand though not necessarily to implement, refer to specific applications in what we will describe here as "e-health."

## E-health today –

Canada currently does not have a fully integrated and comprehensive e-health system. There are several reasons for this, not all of them technical.

### *Community and informal learning: Brantford Public Library*

The Brantford Public Library is a bustling centre of activity. For the nearly 86 000 residents of the city and area, the library and its remarkable number of partnerships are at the hub of a wide range of community and information services. Brantford is at the centre of a largely rural area, and is adjacent to the Six Nations reserve.

The library building houses the offices of a number of partner groups, including the Brant FreeNet, the Business Self-Help Centre and the Literacy Council. The Brant FreeNet provides low-cost Internet access to the community and supplies free Internet access to all public libraries in Brantford and the County of Brant. The Literacy Council's volunteer community-based literacy programs for adults benefit from space for tutor-learner pairs and from proximity to good support materials. As well, the library maintains the Brant Business Information Network. The library has worked with partner organizations in Brant to create this gateway to the best business information resources and a comprehensive, searchable, on-line directory of the 4000 businesses in Brant.

### *Saturna Island School*

Located in the beautiful southern Gulf Islands of British Columbia, Saturna Island (population 350) School is reminiscent of the one-room schools of yore, but with one significant difference: Saturna School is wired to the world! Saturna students are able to access information from around the world while remaining in their local school. Now, Saturna Island School uses video conferencing with school facilities in nearby Sidney. The island's 30 students commute by ferry only half the week now. Previously, students in the middle grades traveled daily via water taxi to Mayne Island to study. High school students traveled via water taxi to Salt Spring Island.

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At root, the social and economic benefits of e-health derive from its capacity to link electronically health professionals, patients, policy makers, administrators, researchers, voluntary health organizations and the general public with each other and with the reliable information they need to perform their respective roles, make informed decisions and hold the system accountable.

This capacity, valuable in its own right, is especially critical today because of other changes taking place in the health system. Instead of a system dominated by hospitals and doctors, the restructuring of health care in the last 15 years has produced a system fragmented into a wide variety of diagnostic and care settings – hospitals, clinics, community health facilities, long-term care facilities, public and private laboratories, pharmacies, and the offices of doctors and a growing number of health professionals. Because of consolidation and rationalization, hospitals themselves often have facilities in several different locations.

For the health system to work effectively, and for e-health to be capable of making its most important contributions, all these sites and all the caregivers located at them, whether in urban, rural or remote areas, must be reliably linked with connections capable of allowing the human interactions required for treatment and providing access to the information needed for everyone to perform their respective role. Despite the investment of billions of dollars, the present range of infrastructure and related e-health applications cannot perform that function.

Although technology is only part of the problem, among the technical reasons why e-health is not yet effective are the following.

- ***Diagnosis usually requires high-quality video imaging:*** Diagnosis typically requires access to X-ray images, CAT-scan results, MRI-scans, ultrasound images and other kinds of graphical and video material. Ideally, such highly visual material should be available to professionals in rural and remote locations to support tele-medicine. It should also be integrated with electronic health records so that health professionals anywhere in Canada can revisit earlier diagnoses when examining a patient. If the system is to avoid subjecting the patient to a costly and sometimes health-threatening duplication of tests, procedures and questions at each diagnostic and care setting, then this electronic health record must be electronically accessible throughout the system. As well, for sophisticated tele-health procedures, these high-quality video images must be available in real time. Depending on the diagnostic procedure, the required bandwidth at each professional's workstation could range from dial-up modem speed for non-real-time video imaging to 100 Mbps for 3-D interactive brain imaging.
- ***Low delay times and high bandwidth are crucial to remote diagnosis and treatment and health professional use of the technology:*** A delay time of less than 250 milli-seconds is considered necessary for an effective tele-health consultation. An important dimension of diagnosis is often observing the way a patient moves. Gait analysis depends on having a high resolution and a high frame rate, requiring at least an effective bandwidth above cable modem or xDSL speed. Long delay times can also distort diagnoses in psychiatric evaluations or neurological assessments. High latency can also reinforce the reluctance of many health professionals to use the new technology. In short, true broadband connections reduce latency times to acceptable levels and improve the quality of tele-consultations.
- ***Easy and rapid access to a reservoir of rich, visual information is critical to successful use of clinical decision-support systems and professional upgrading:*** Just as medical diagnosis requires high-quality video imaging, the systems to support clinical decisions and professional upgrading require access to a wide array of highly visual material. Only broadband can support the downloading of such material and easy and rapid searches through health databases here in Canada and around the world. In fact, the ease of use possible with broadband may well represent an important way to convince health professionals to use e-health applications. Clinical decision-support systems using simple Web-browsing technology would require at least cable modem or xDSL class

network access. Advanced systems allowing the transfer of diagnostic images in near real time (five seconds for a 10-megabyte image) could also function with that technology, although 10 Mbps to the desktop would be preferable.

While many hospitals have high-speed connections, these are certainly not available on the desktop of every health professional seeing patients inside an institution; nor do many institutions have infrastructures with the required bandwidth. This situation is hardly surprising, since the bandwidth requirement is often not readily available, and many diagnostic and care settings lack a secure broadband connection with hospitals and with each other. In the absence of such connections, tele-health will be unable to achieve its potential. More seriously, the lack of such connections to doctor's offices means that doctors will not create or use electronic health records and thus most Canadians will not have them. As shall be seen below, these represent perhaps the most essential foundation for an e-health "infostructure" and are prerequisites to the capturing of its social and economic benefits.

## E-health tomorrow –

An effective e-health infrastructure will radically alter the health system in numerous ways. Two of the most important effects will arise through improved access to services and to information on the part of individuals. Tele-homecare, or the use of information and communication technology to support health care services in the home, is one of the most sought after services. Improved access to health information generally will also contribute significantly to the quality and cost-effectiveness of the health system. Both require broadband networks.

- ***Tele-homecare*** may become increasingly important as a means of reducing unnecessary visits to hospital emergency rooms, reducing unscheduled visits to physician's offices, preventing repeat hospitalizations, teaching patients to manage early symptoms and gathering information on vital signs. Though even the telephone can make home care more effective, the real gains will come with advent of new tele-homecare applications using broadband to allow "always on," jitter-free examination of moving medical gauges, continuous patient monitoring and advanced assessments via video conferencing. Such home tele-monitoring will require at least one or more Mbps for the home connection.

### *Tele-Radiology in Nova Scotia*

At Buchanan Memorial, a community-based hospital in rural Nova Scotia, paramedics arrive with two victims. Injuries sustained in an ATV accident 30 minutes before reveal major trauma to the lower limbs, pelvis and neck areas. X-rays of the limbs and pelvis appear normal but there is a questionable deformity at one area of the cervical spine. The tissue damage observed in the lower limbs requires debridement and antibiotic coverage. The patient cannot be moved until the above clinical questions are answered.

At the Antigonish Regional Centre, 270 kilometres away, radiologists are brought on-line to assist with management. The X-rays are transmitted from Neil's Harbour to Antigonish. The specialist can view the wounds and discuss options with the physician in minutes. The patient is treated and evacuated by ambulance to Antigonish for definitive care. Tele-Radiology helped determine proper treatment and save costly emergency air transportation.

### *Remote diagnosis in Nunavut*

The value and convenience of satellite access technology were recently demonstrated in Pond Inlet, where eight people, including four children, were on a waiting list to see a dermatologist. When the skin specialist arrived in Iqaluit, only two residents from Pond Inlet were able to make the trip (900 air miles) to Iqaluit. Without this technology, the other six residents would have had to wait several more months until the specialist visited again. Using a satellite link-up, the specialist was able to see all six of them in one evening.

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- ***Empowering the public with health information*** is a crucial element in the e-health vision. According to the Advisory Council on Health Infostructure, "Making health information available to the public is an essential public good with enormous and positive implications for transforming Canada's health care system." Already, more than 20 000 Web sites have been established to provide health information to consumers. Health Canada has involved hundreds of voluntary sector and other partners in the creation of a Canadian Health Network that provides reliable health information and access to a wide variety of health sites. With only dial-up access, searches on these sites can be a laborious, time-consuming and discouraging to consumers. In addition, as noted in the previous section, the most useful kinds of health information are richly visual and graphic and require a broadband connection to download in a reasonable time.

According to the Canadian Institute for Health Information, Canadians now spend $95 billion a year on health care and view our health care system as a national asset. But the system is under tremendous stress. All governments in Canada recognize that health sector reform will be critical to meeting the challenges facing the nation's health care system. They also agree that a key element to these reforms will be the strategic use of ICT throughout the sector.

- Over the last 20 years, information about an individual has tended to become distributed and fragmented, as there has been no effective means to share access to patient information among clinics, hospitals and doctor's offices. Electronic health records promise to integrate the system around the patient, thereby ensuring continuity of care and reducing the expensive and sometimes health-threatening duplication of tests, procedures and information gathering.
- Tele-health will be critical to supporting effective home care for the growing number of elderly persons and people released early from hospitals. Studies indicate that home care is usually better for the patient and cost-effective compared to staying on in hospital.

### *Satellite-based Community Services in Newfoundland and Labrador*

Since 1998, a satellite-based, high-speed, fully-meshed communication infrastructure has been deployed in Newfoundland and Labrador to serve nine communities under the Remote Community Services Telecentre (RCST) project. This multimedia communication infrastructure is used for medical consultations between nurses in remote sites and medical staff at Memorial University in St. John's, for high-speed access to Internet and government services, for bail hearings and for meetings by representatives of government and commercial organizations who are separated by great distances.

Use of these facilities has grown from 50 hours a month in the early days of the service to over 1400 hours a month today.

Participating communities benefit from real-time access to a variety of public services, from savings in travel time and associated costs and from opportunities to explore new business possibilities together.

- Tele-health can radically improve both the quality and accessibility of care in rural and remote areas. The savings in transportation and lodging costs for patients and family can be significant. Providing such services also adds to the social and economic viability of communities.
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## E-Content

E-content uses high-speed broadband infrastructure and is interactive, collaborative and integrated in structure and functionality. E-content includes economic, social and cultural applications, from both industrial and entertainment sectors as well as specialized content in the fields of education and health. E-content is thus a horizontal application that cuts across many different sectors, as well as being a sector in its own right specifically focused on cultural and entertainment products.

### E-content today –

E-content, whether it is found in health, education, culture or entertainment, is at a very early stage of development. It is predominantly a product of the multimedia industry.

The sector is often viewed as a product of the convergence of content media – particularly, broadcasting, film and print media – and telecommunications and the Internet. In this model, the interactive, computer-centric world of the Internet is seen as merging with the comparatively non-interactive, content-creating world of media (e.g. broadcasting, newspapers, publishing, exhibition, film) to produce a dizzying proliferation of new forms of content and media that will change the face of entertainment and information delivery.

***Nunavut's Living Dictionary***

The Web-based Inuktitut Living Dictionary **(http://www.livingdictionary.com)** has been named Asuilaak – an Inuktitut word that means "that which was expected has arrived." Asuilaak will be the world's first on-line collaborative dictionary in Inuktitut, English and French. Asuilaak will serve as a translation reference and a repository of information on the Inuktitut language. This Web-based on-line dictionary invites Inuktitut speakers and language experts worldwide to contribute their knowledge of Inuktitut words and definitions, as well as translations to English and French. Containing Inuktitut words and definitions from several glossaries and existing dictionaries, this site is easily accessible, as well as constantly updated by its users. It is a dictionary of words in Roman orthography, syllabics, French and English – a living dictionary because people can interact over the Internet to create new Inuktitut words as they are needed. It will also be a valuable tool for teaching Inuktitut to current and future generations.

A part of this activity entails mergers and acquisitions involving companies seeking ways to get an edge in the market expected to develop when Internet capacity increases to allow delivery of multimedia-enriched content to the individual via computer, Internet appliances or interactive television.

### E-content tomorrow –

Many observers believe e-content could become the dominant information and entertainment product of the 21st century. As the Internet incorporates broadcasting, movies, books, music, drama and other traditional art forms, they will be transformed into new products that will play a prevailing role in the cultural, social and economic landscape of the 21st century, just as their predecessors did in the 20th century.

- ***Empowering the public with health information*** is a crucial element in the e-health vision. According to the Advisory Council on Health Infostructure, "Making health information available to the public is an essential public good with enormous and positive implications for transforming Canada's health care system." Already, more than 20 000 Web sites have been established to provide health information to consumers. Health Canada has involved hundreds of voluntary sector and other partners in the creation of a Canadian Health Network that provides reliable health information and access to a wide variety of health sites. With only dial-up access, searches on these sites can be a laborious, time-consuming and discouraging to consumers. In addition, as noted in the previous section, the most useful kinds of health information are richly visual and graphic and require a broadband connection to download in a reasonable time.

According to the Canadian Institute for Health Information, Canadians now spend $95 billion a year on health care and view our health care system as a national asset. But the system is under tremendous stress. All governments in Canada recognize that health sector reform will be critical to meeting the challenges facing the nation's health care system. They also agree that a key element to these reforms will be the strategic use of ICT throughout the sector.

- Over the last 20 years, information about an individual has tended to become distributed and fragmented, as there has been no effective means to share access to patient information among clinics, hospitals and doctor's offices. Electronic health records promise to integrate the system around the patient, thereby ensuring continuity of care and reducing the expensive and sometimes health-threatening duplication of tests, procedures and information gathering.
- Tele-health will be critical to supporting effective home care for the growing number of elderly persons and people released early from hospitals. Studies indicate that home care is usually better for the patient and cost-effective compared to staying on in hospital.

***Satellite-based Community Services in Newfoundland and Labrador***

Since 1998, a satellite-based, high-speed, fully-meshed communication infrastructure has been deployed in Newfoundland and Labrador to serve nine communities under the Remote Community Services Telecentre (RCST) project. This multimedia communication infrastructure is used for medical consultations between nurses in remote sites and medical staff at Memorial University in St. John's, for high-speed access to Internet and government services, for bail hearings and for meetings by representatives of government and commercial organizations who are separated by great distances.

Use of these facilities has grown from 50 hours a month in the early days of the service to over 1400 hours a month today.

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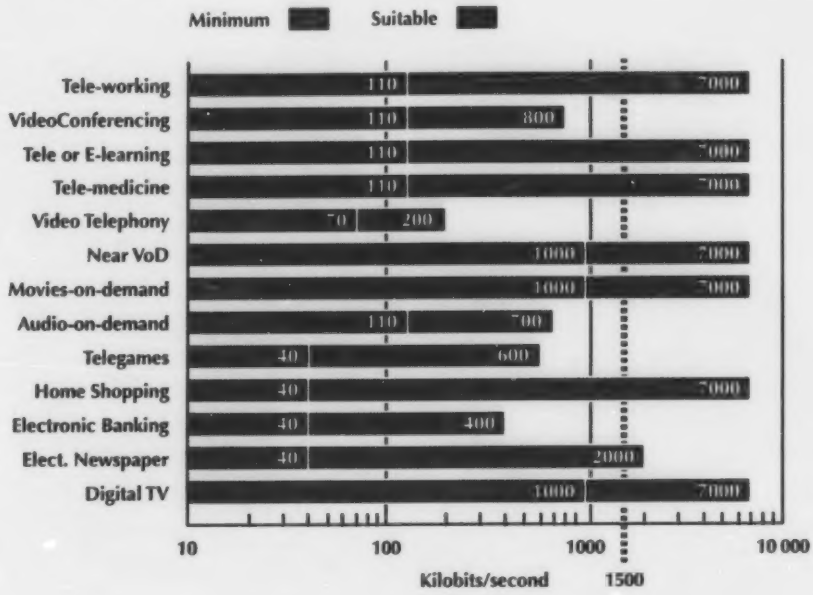
**FIGURE 2**
**Bandwidth Requirements for Selected Applications**
Minimum and suitable speeds required by application




*Source:* www.plannedapproach.com/community.htm
*Plannedapproach Inc.*

One of the challenges for Canada will be how to accelerate advanced content applications development in order to be positioned as advantageously as possible.

In addressing this challenge, however, it is difficult to predict precisely what kinds of e-content will emerge, what types of applications will surround that content, or what the configuration of tomorrow's information and entertainment "highway" will have. Certainly, it will require considerable bandwidth to the home.

Television broadcasting with CD-quality stereo audio, for example, will require a distribution network capable of delivering at least one Mbps to the home. Providing compressed surround sound with video would need even higher bandwidth. Decent National Television System Committee (NTSC) quality video on demand would require a bandwidth of up to 6 Mbps, while fully interactive television would require even higher bandwidth – up to 10 Mbps or more. See Figure 2 for more examples of bandwidth requirements for various applications.

Broadband technology and new content development are inextricably interdependent. Without broadband, the new content will not emerge; but broadband without enticing new content will not attract users' interest or allegiance. Broadband promises an ease of use and transparency that will allow, at least in the perception of consumers, a progressively less technology-mediated relationship with ever more sophisticated forms of content.

As broadband access expands over the next few years, there will be explosive growth in interactive, on-line entertainment, particularly multi-player traditional and video games that will engage a broad spectrum of the consumer market. Whereas younger people are perceived as the key market, many adults are now beginning to participate in interactive entertainment and the opportunity for more engaging activities will accelerate as broadband proliferates.

Over the last 15 years, the Internet has proven to be extremely valuable to the scientific, engineering and academic communities. Today, state-of-the-art advanced broadband networks are being developed by these same communities for a variety of experimental and operational purposes. Among the areas of research, several are dealing directly with the study of "content."

Current areas of research involving information technology (IT) and advanced networks include:

- developing machine learning or artificial intelligence;
- defining innovative search strategies;
- discovering the "meaning" expressed in content; and
- finding effective and efficient ways to structure, transmit and visualize complex multimedia content.

Many of these areas of active research can be expected to open new vistas on the development and use of digital content.

From a consumer market perspective, the content producers in the countries that first extend broadband to a majority of residents will have an enormous advantage in global markets for advanced content. In all likelihood these new kinds of advanced content will in today's terms constitute what we call movies, books, television programs, records, newspapers and periodicals. In tomorrow's terms, content will incorporate multiple interactive media with data mining capabilities that are intuitive and easy to use.

It will be important for Canada to consider how to leverage its leadership position in broadband to create a pre-eminent position in the production, distribution and exhibition of advanced content.

## 1.3 A Shared Vision: Bringing Broadband Benefits to All Canadians

In light of the many benefits broadband will enable in our economic, social and cultural life, it is clear that market forces will continue to be the main driver of broadband development for businesses, residential consumers and some public services.

However, for a significant proportion of the Canadian population, there presently is no business case for the deployment of broadband networks and services. To include these Canadians in the economic and social benefits of the broadband revolution, we have to be prepared to "go the full distance," and to find ways and means of extending broadband services to these communities.

As the words in the accompanying text boxes illustrate, Canadians in First Nation, Inuit, rural and remote communities *want* to be included in the broadband revolution.

If we can find a way to empower these communities to take advantage of the broadband revolution – and if we can successfully adjust the way in which many markets, public services and government institutions currently operate so as to take full advantage of broadband opportunities – the residents of these communities, their partners in development, other stakeholders and all Canadians will benefit both directly and indirectly.

In our vision – a vision that is shared by the many Canadians who submitted contributions to assist the work of the Task Force – the broadband revolution has the potential to bring all Canadian communities new opportunities for:

### General benefits –

- harnessing new technologies to improve local access to communications, health, education, distance and lifelong learning, e-commerce, banking, culture and information services;
- developing skills in ICT;
- providing residents with access to information and knowledge presently unavailable to them;
- reducing duplication of services and increasing efficiency as a result of sharing resources and expertise offered by government, educational and community organizations and individuals, within communities and across regions;

- reducing the socio-economic gap between northern and southern populations within a province and across Canada;
- reducing out-migration as a result of increased local economic opportunity and improved quality of life; and
- maintaining territorial sovereignty.

### Economic benefits –

- adding value to and benefiting from a strong local economy based on sustainable development;
- helping make the region or community more economically self-sufficient by providing a range of ICT-based services that address local needs in the areas of communications, distance or lifelong learning, e-commerce, health, education, culture, environment and sustainable development;
- sharing best practices and selling products and services on the Internet;
- increasing and diversifying economic activity;
- increasing the number of local businesses using e-commerce; and
- Increasing the local tourist industry, e.g., as a result of more effective marketing and the on-line presence of local arts and crafts.

### Social benefits –

- increasing the level of community services available;
- enhancing local quality of life through new and expanded access to health, learning, social and cultural programs;
- improving the ability for residents to express their personal, cultural and linguistic diversity fully both within their own community and in Canada;
- providing better protection for the local culture (especially for Aboriginal peoples); and
- providing residents with the opportunity to participate fully and directly in the democratic processes of governance.

***Words from Canadians...***

"Kawawachikamach is a small, isolated village that has none of the educational, commercial and governmental services found in larger urban centres. As with most isolated northern communities, Kawawachikamach faces very significant student drop-out rates and high rates of unemployment. There is currently no cost-effective, reliable Internet access available to members of the community... Several benefits can be expected to accrue from connecting Kawawachikamach to the Information Highway with a reliable, low-cost, high-speed Internet connection, including, but not limited to human resource development, through the utilization of long distance learning programs; employment over the Internet, such as with data-entry companies; access to on-line federal governmental services such as Info-Entrepreneur; access to banking services which are presently non-existent in the region; access to information on Health Canada programs and to medical databases, such as the planned First Nations and Inuit Health Information System; and exposure to other Native and non-Native communities. Access to reliable, high-speed Internet connection can act as a catalyst that increases the community's interest to improve on existing computer skills as well as to acquire new skill sets.... A reliable high-speed Internet connection can also contribute to the development of the tourism industry."

**Naskapi Nation of Kawawachikamach, Quebec**

"Broadband must not be defined by need, but rather by opportunity. Opportunity is what creates need, which results in innovation, which results ultimately in success.

"Build it sooner rather than later for those that need it most – there are still many communities with no access – broadband infrastructure is not just a benefit, but is essential for community survival."

**"Enabling Opportunity: Newfoundland and Labrador Stakeholder Report" prepared by Operation ONLINE Inc.**

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"As an educational leader, and IT researcher, I am quite pleased to hear of this recent development and can wholeheartedly say that the education sector will require high-speed Internet access to continue to meet the needs of students, staffs, parents and the business community. We look forward to hearing about implementation details."

**Mark Wylie, BEd, MSc**
**Principal, Manyberries School**
**Prairie Rose School Division**
**Manyberries, Alberta**

"Reliable and high/sufficient Internet access is not a luxury anymore – it's a necessity in order to receive basic services in some rural areas... In the rural communities, it's cheaper to provide broadband Internet than it is to subsidize banks and other services so it's only common sense to provide them with the means to access those services through broadband Internet access."

**David Oxford**
**Emerald Zone Corporation**
**Springdale, Newfoundland**

"...every community, every region is frustrated with the limited access to broadband service, the slow pace of implementation of infrastrucuture, the disparity of services available throughout the riding, and thoughout the province and Canada. As well, businesses are telling us that the surcharges and higher prices that are charged in under-served areas, such as ours, makes it difficult to justify staying and growing their businesses here in the riding."

**Respondent, Northumberland Research, Innovation and Technology Report, Northumberland, Ontario**

"In an age when high speed is advancing as rapidly as it is, what do we really do for a community by equipping it for low-speed access? While something reliable is definitely better than nothing at all, it is poor long-range thinking to target a service level that we already know is losing functional effectiveness."

**Respondent from British Columbia: Rural, Secretariat Consultation**

***Highlights from the Rural Secretariat Consultation:***

*From March 20 to April 3, 2001, the Rural Secretariat of Agriculture and Agri-Food Canada informally consulted more than 500 citizens in rural and remote communities from every province and territory in Canada related to their level of Internet access, their challenges in obtaining high-speed access and their perceptions about the potential of the technology to benefit their community. The group surveyed represented an existing network of citizens who already use the Internet and who possess some knowledge of the use or potential use of high-speed access.*

- Local dial-up access is the most common method for connecting to the Internet.
- The majority of users (54 percent) were not satisfied with their present Internet connection.
- There was considerably lower satisfaction among those using dial-up access compared to those with high-speed access.
- Over 90 percent of respondents indicated the need for high-speed access.
- Over 80 percent of respondents indicated broadband access as a priority personally, and 76 percent said it was a priority for the community.
- Broadband access was identified as a community priority because of its ability to help economic development and competitiveness.
- Cost and infrastructure were the two most frequently mentioned challenges to obtaining broadband access.
- Over 80 percent of respondents felt it was appropriate to use tax dollars to help provide broadband access.

***This report is about the physical, economic and social distances that separate Canadian communities and about the possibility of using broadband communications to help bridge these gaps. First and foremost, therefore, it is a report about improving the overall quality of Canadian life in the interconnected world of the 21st century.***

## 2.1 Quality of Life: The Measure of All Things

From the beginning, there was a feeling in the Task Force that our work was not just about technology, but that it was also about nation building and how to improve the quality of life of Canadians as we move forward into the 21st century.

How do we measure quality of life (QOL)?

Each year the United Nations (UN) ranks the quality of life of people living in different countries by using a specially designed human development index (HDI) that measures their average level of health, education and wealth.

These three fundamental factors underlie a much wider range of human possibilities. They set the parameters for economic, social, cultural and political development, and have an important influence on the relationship between human societies and the natural environment.

Since the UN began publishing the *Human Development Report* in 1990, Canada has ranked first eight out of 10 times, including the last seven years in a row. Looking back further, at where countries stood at five-year intervals beginning in 1975, Canada has ranked first at every quality of life checkpoint for the past 25 years in comparison to other G7 countries.

From this data, it is fair to say that Canadians enjoy the highest quality of life of any people in the world today – as they have for the last quarter century.

All Canadians can be justifiably proud of this record. However, when we in the Task Force looked beyond our overall results, we found that there are significant gaps between the quality of life enjoyed by Canadians living in urban areas today, and those living in rural, remote, First Nation and Inuit communities. And when we looked ahead at the main challenges that will face Canadians in the next few decades – in particular, at the challenges we face in improving the performance of economy and of our learning and health care systems – we found reason for concern that these gaps would widen.

Why is this so?

As Canadians are generally now aware, the use of information and communication technologies is becoming increasingly pervasive in almost every area of life. There is widespread recognition that, by providing easy, on-line access to information, human expertise and knowledge resources, ICTs contribute to innovation, productivity and competitiveness in every economic sector. They have the potential to improve the quality and efficiency of public services, they are a virtually unlimited source of information and entertainment, and they open new paths to communication and understanding.

As we tried to describe in the preceding chapter, broadband communications have the potential to increase exponentially the opportunities and benefits that could be derived from the application of ICTs in these and other domains.

Canadians living in urban areas are well placed to reap these benefits. They enjoy ICT connectivity that is among the best in the world.

However, the Task Force found that the situation is very different in rural, remote, First Nation and Inuit communities. Today, there is a "connectivity" gap between Canadians living in these communities and those living in urban settings. In the future, as the performance of both economic structures and public institutions becomes increasingly dependent on access to advanced ICTs, there is every danger that these communities will be left behind and that the QOL gap will widen.

This chapter lays out the dimensions of the QOL and connectivity gaps that separate Canadians living in rural, remote, First Nation and Inuit communities (including Métis communities) from their urban co-citizens. This analysis provides a baseline for assessing the need to take initiatives aimed at closing the connectivity gap that separates these communities, as well as the QOL opportunity of so acting.

### Canada's QOL Gap: Rural Communities

In seeking to make Canada a better place to live, clearly one of our main challenges is to close gaps in the quality of life between Canadians living in metropolitan areas – large cities and the commuting areas around them – and those living in small cities and rural areas.

While a majority of the population is highly urbanized, a minority is widely dispersed over vast areas. Urban and suburban centres account for 83 percent of the population, but only 29 percent of total communities, that is 1720 of 5984 communities.

The remaining 17 percent of the Canadian population is spread over 4264 communities.

How does the quality of life of rural Canadians compare with that of urban Canadians?

The 1996 census data reveal a significant quality of life gap between urban Canada and the rest of the country. In particular, when we use the three basic quality of life indicators to compare rural Canada to urban Canada we find that rural Canada has:

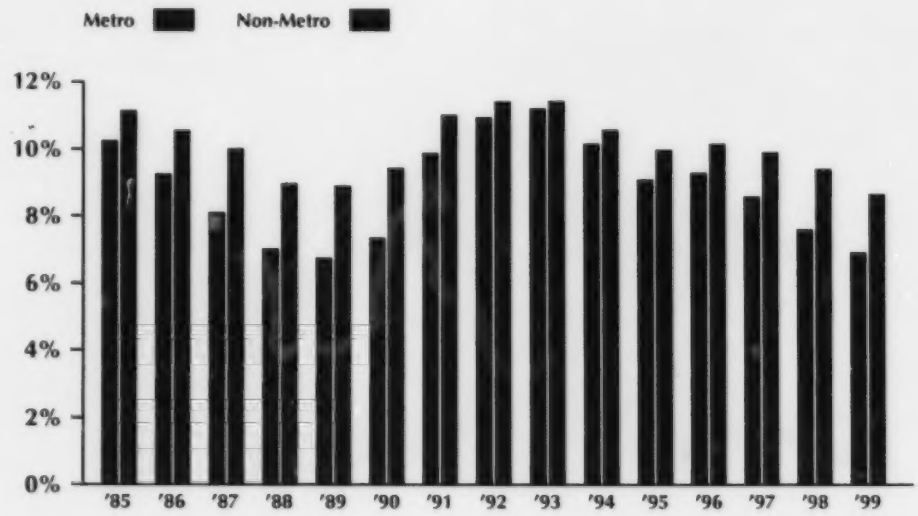
### An economic gap –

- unemployment is higher and more stable (see Figure 3);
- incomes are lower;
- government transfers account for a larger share of total income; and
- young people are moving away from many rural and remote communities to seek opportunities in cities.

## Distance makes a difference ...

**FIGURE 3**

**Unemployment is Higher in Non-Metro Areas**

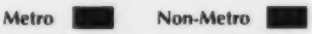



*Metro: centres with a population of 100 000 or more.*
*Non-Metro: all areas under 100 000 population.*
*Source: Statistics Canada, Labour Force Survey.*

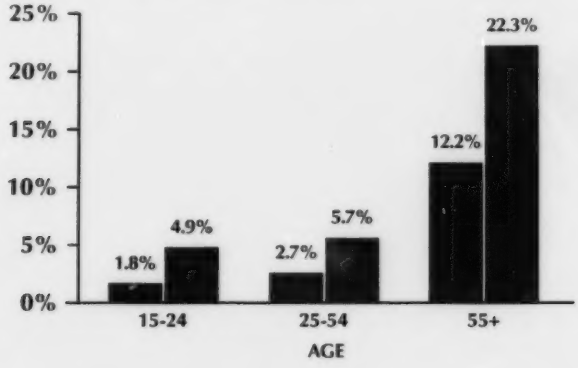
## A learning gap –

- levels of educational attainment are lower for all age groups (see Figure 4); and
- training rates are lower, even when job requirements, age and education are taken into account.

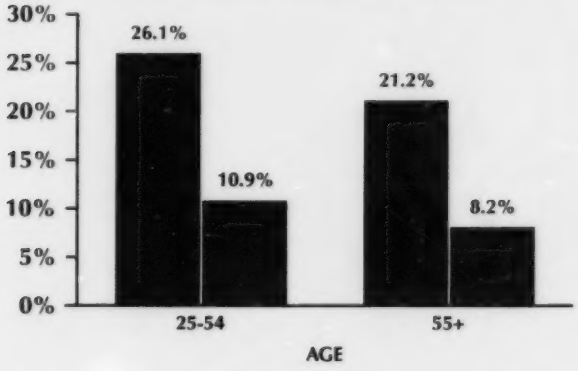
**FIGURE 4**
**Education is Lower in Non-Metro Areas**




Share of labour force with Grade 9 or less as the highest level of education achieved, 1999



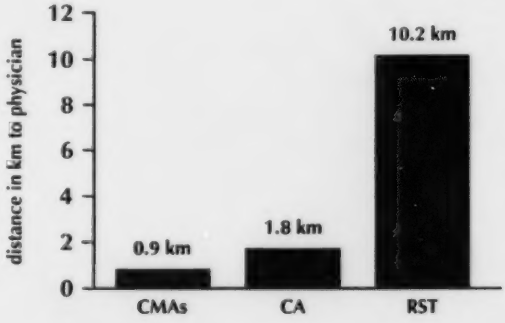

Share of labour force with a university degree, 1999




*Metro: centres with a population of 100 000 or more.*
*Non-Metro: all areas under 100 000 population.*
*Source: Industry Canada calculations based on Statistics Canada (LFS).*

**FIGURE 5**
**Nearest Physicians Further Away in Rural Canada**

Rural and small town Canadians live, on average, 10 km from a physician (in 1993)




*CMA: census metropolitan area (population 100 000 plus).*
*CA: census agglomeration area (population 10 000 plus).*
*RST: Rural and small town Canada.*

*Source: Ng Edward et al. "How far to the nearest physician?" In* Health Reports, *vol. 8, no. 4, Spring 1997, pp.19-31.*

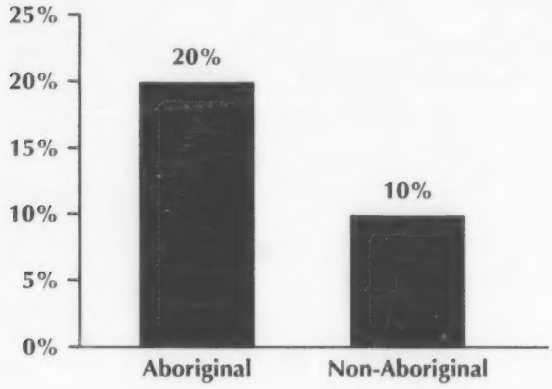
## A health care gap –

- there are fewer than half as many doctors per 1000 people in rural Canada, and rural residents on average must travel five times as far to visit a doctor (see Figure 5).

There are of course some quality of life benefits in rural areas. For example, although incomes are lower, so is the cost of living. And rural residents are only half as likely as urban residents to feel unsafe, perhaps in large part because the incidence of personal and property crimes is 30 percent lower in rural areas.

Nevertheless, if we look at the three primary QOL indicators, it is clear that there are significant quality of life gaps between urban and rural Canadians.

**FIGURE 6**
**Aboriginal Unemployment is Higher than Non-Aboriginal**
Unemployment 1996 Census




*Source: Indian and Northern Affairs Canada*

"We must use the latest advances in high technology to connect ourselves to the information highway. It is through technology that we can catch up, that we can connect native communities – especially those living in remote communities – to the rest of the world. This will allow us to compete. We missed the Industrial Revolution. We will not miss the Information Technology Revolution. We have a few business and high-tech success stories, but you never hear about them. Just check out the National Aboriginal Achievement Awards Web site (**http://www.naaf.ca**)."

***Matthew Coon Come, Grand Chief of the Assembly of First Nations***

## Canada's QOL Divide: Aboriginal Peoples

Almost 1.4 million Aboriginal people live in Canada – in metropolitan centres, in band communities neighbouring urban centres and in rural and remote areas extending to the most northern reaches of the country.

Aboriginal peoples make up about 4.5 percent of the country's total population. They are a young and rapidly growing part of the country. More than half are under 25, and the Aboriginal population is expected to increase by almost 40 percent over the next 15 years, as a result of a birth rate which is double that of non-Aboriginal Canadians.

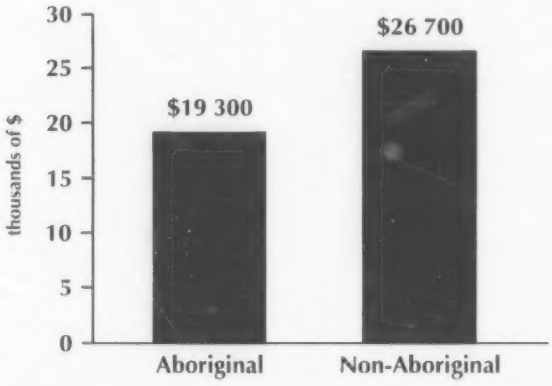
How does the quality of life of Aboriginal peoples compare with that of other Canadians?

The answer is very clear – and very troubling.

If we use the three main indicators of quality of life – wealth, learning and health – to compare the situation of Canada's Aboriginal peoples to that of other Canadians, we find gaps so large that they constitute a real divide.

Specifically, if we compare the situation of Aboriginal peoples and other Canadians, we find:

**FIGURE 7**
**Aboriginal Income is Lower than Non-Aboriginal**
Average Income

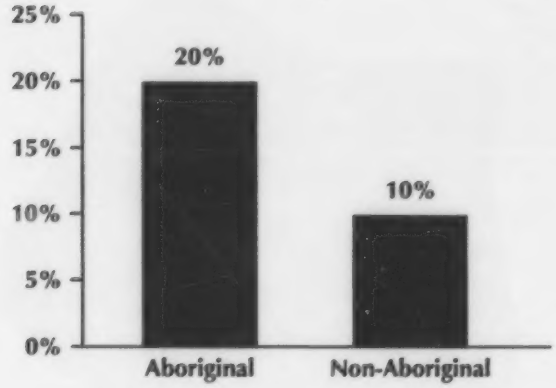



*Source: Indian and Northern Affairs Canada*

### An economic divide –

- the unemployment rate among Aboriginal peoples is double that of non-Aboriginal Canadians (see Figure 6);
- average annual incomes are about half (see Figure 7); and
- registered Indian families living on reserve are twice as likely to be single-parent families.

**FIGURE 6**
**Aboriginal Unemployment is Higher than Non-Aboriginal**
Unemployment 1996 Census

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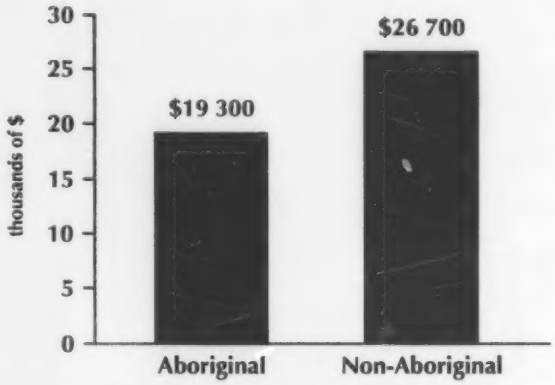


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- the unemployment rate among Aboriginal peoples is double that of non-Aboriginal Canadians (see Figure 6);
- average annual incomes are about half (see Figure 7); and
- registered Indian families living on reserve are twice as likely to be single-parent families.

**A learning divide –**

- levels of educational achievement are significantly lower, particularly at the post-secondary level.

**A health care divide –**

- the average life expectancy of Aboriginal peoples is 74, while it is 79 for other Canadians;
- the suicide rate is more than twice as high;
- in remote northern communities, more than two thirds of the population live more than 100 kilometres from a doctor; and
- registered Indian families living on reserve are six times more likely to live in crowded dwellings.

## 2.2 Sustainable QOL: The New Nation-Building Challenge

From the foregoing analysis it is clear that even if nothing changed and everything remained the same as it has been for the last 25 years, our country would face significant challenges in extending the quality of life that many Canadians have come to enjoy to those segments of our population that have not been so fortunate – particularly to Aboriginal peoples, and to people living in rural areas.

Unfortunately, we do not have the luxury of assuming that nothing will change fundamentally over the next quarter century, and that the policies and strategies which have served our nation and its people so well in the past will continue to be as effective in future.

In fact, over the next 25 years, many aspects of Canadian life will undergo profound changes.

These changes will transform the economic and social structures that nurture, produce and support the basic determinants of quality of life – wealth, learning and health.

All Canadians will feel the impact of these changes, wherever they live.

### Creating Wealth in the New, Knowledge-Based, Globally Networked Economy

As in the past, building a strong economy is one of the fundamental challenges of nation building.

A strong economy rewards effort by generating wealth for Canadians to consume and invest. It also enables the Canadian community at every level to redistribute wealth to provide the public facilities and services required to support continuing growth and ensure a satisfactory standard of life for all Canadians.

Over the last 25 years, there have been critical changes in the structure of our economy.

- Employment has shifted from the resource and manufacturing sectors to services (the phenomenon of post-industrial society).
- Knowledge obtained through research and development has become an increasingly important input to production processes in all economic sectors (the phenomenon of the knowledge economy).
- The educational levels needed for well-paying jobs have steadily increased, as have requirements for ongoing training to maintain skills in rapidly changing job markets (the phenomenon of lifelong learning).
- Computers and telecommunication networks have become the main tools for creating, processing, communicating and storing the information required to run organizations, as well as to provide products and services in all sectors of activity (the phenomenon of the information economy and society).
- New organizational structures and practices have been developed to manage work that is becoming more information rich and knowledge intensive (diverse phenomena, including quality circles in manufacturing, inverted hierarchies in services, tele-work and flat organizations in all sectors).
- Global competition is increasing in every economic sector, and we are becoming much more dependent on trade to generate national wealth (the phenomenon of globalization).

With the benefit of hindsight, we can see that the development of knowledge networks that link people, provide access to information resources and control production processes have been an integral part of all of these changes.

Until quite recently, the progressive transformation of our economy into a new economy which is knowledge-based and globally networked, has escaped the attention of the general public – even though many of us were exposed to at least some of the changes that were taking place on a daily basis, at our places of work or study.

In the last five years, there has been a dramatic increase in public awareness of what has been happening, thanks to the phenomenon of the Internet.

Before 1995, access to the rapidly growing power of global knowledge networks – including the original Internet itself – was more or less restricted to researchers, engineers and computer professionals. This was so for reasons of cost and complexity.

The picture changed totally with the development of the World Wide Web and Internet browsers. These two innovations did more than make the Internet accessible to the general public and small businesses. They also provided a way to overcome many of the technical limitations that previously had held back the widespread use of knowledge networks within large organizations.

These developments triggered a wave of product and service innovations and unleashed a period of growth that is unparalleled in the history of communications media (the "dot.com" phenomenon).

During the 1995-1999 period, the new, knowledge-based, globally networked economy built on the Internet and other communication systems experienced – for the first time since the 1960s – a sustained period of:

- high growth;
- increased productivity;
- low inflation; and
- high job creation.

**FIGURE 8**
**Productivity Growth in ICT-Intensive Industries in Canada**

*Productivity is defined as GDP per hour.*
*FIRE: Finance, insurance, and real estate.*
*Source: Industry Canada, based on Statistics Canada data.*

More than 60 percent of Canada's productivity growth since 1995 has come from the ICT sector (see Figure 8). Growth was highest in those sectors which were intensive ICT users such as wholesale and retail trade, finance, insurance and real estate.

This achievement led authorities to conclude that the "productivity paradox," which had surrounded the use of computers for the previous decade, had finally been solved.

This paradox arose from the observation that the widespread deployment of personal computers in offices had not resulted in measurable productivity gains, in spite of the information processing power they made available on the desktop.

"... the recent period has been marked by a transformation to an economy that is more productive as competitive forces become increasingly intense and new technologies raise the efficiency of our businesses... information technologies have begun to alter significantly how we do business and create economic value, often in ways that were not foreseeable even a decade ago."

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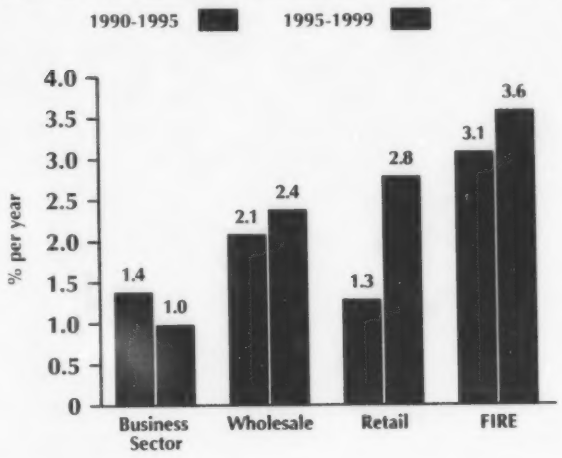


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The Internet appears to confirm what many had suspected – that the benefits of computer technology would only be realized when they could not only be linked with each other, but used easily as a means to communicate information and knowledge between people.

In spite of the recent downturn in dot.coms, tech stocks and markets in general, we side with those who believe that there is no reason to doubt the validity of the conclusion that we are in a new economy.

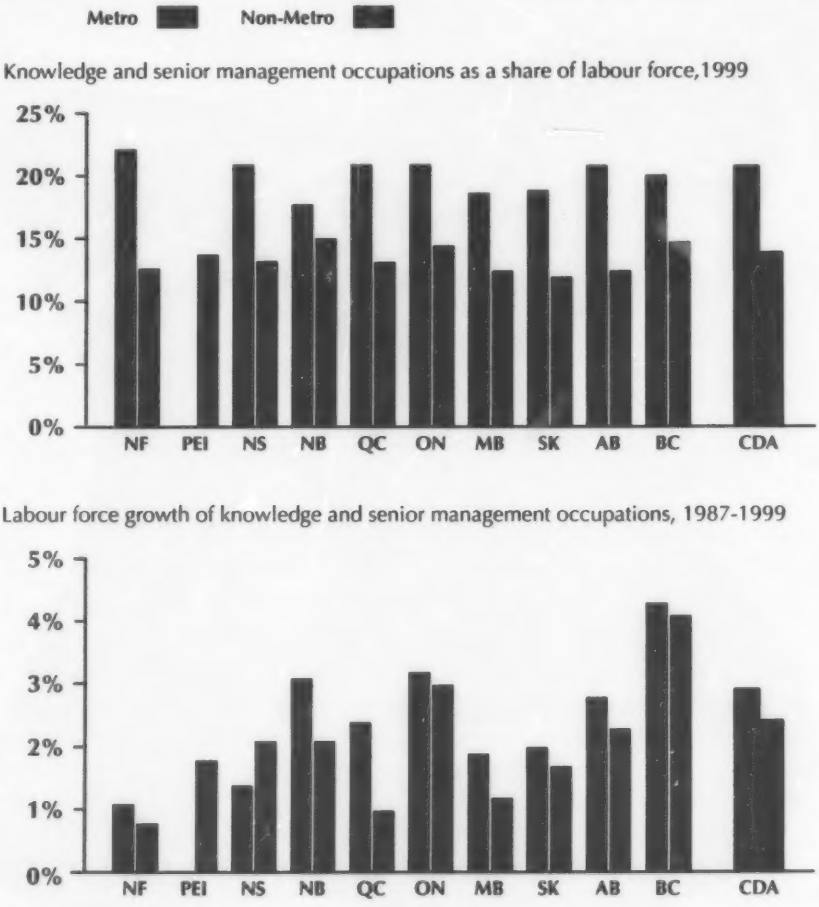
If this is so, there is every reason to be concerned that the economic gaps in employment and income that divide rural and Aboriginal peoples from their urban counterparts are structural phenomena, which reflect the divide between the new, knowledge-based, networked economy and the old economy that preceded it.

Statistical analysis confirms what we intuitively know. In comparison to urban Canada:

- jobs in rural Canada are concentrated in traditional economic sectors such as the primary industries and construction;
- rural Canada has a much smaller share of jobs in the fast-growing business and professional sectors;
- rural Canada has fewer knowledge and management workers (see Figure 9); and
- fewer firms in rural Canada adopt advanced technologies.

If indeed there is a structural divide between the economies of urban and rural Canada, structural solutions will be required.

**FIGURE 9**
**Non-Metro Areas Have Fewer Knowledge Workers* as a Share of the Labour Force**




*Metro: centres with a population of 100 000 or more.*
*Non-Metro: all areas under 100 000 population.*

**Knowledge workers are defined as workers in occupations which involve the production of knowledge or the provision of an expert opinion, based on M. Lavoie and R. Roy, "Employment in the Knowledge-Based Economy: A Growth Accounting Exercise for Canada," Human Resources Development Canada, 1998.*

*Source: Industry Canada calculations based on Statistics Canada (LFS).*

## Transforming Traditional Educational Practices into Lifelong Learning Systems

The transformation of global economic structures means that we have to transform our educational and training systems to prepare Canadians to take advantage of the new requirements and opportunities they will face in the job market.

- The volume of information and knowledge is increasing at an exponential rate.
- The knowledge required for good jobs is increasing, and new skills are in demand.
- Levels of education are rising around the world, and there is increasing competition in areas where Canadians previously held comparative advantages (e.g. software engineering).
- Success in the market place less and less requires learning one set of knowledge and skills that will last a lifetime. More and more, it requires the flexibility and the skills required for lifelong learning and adaptation to a continually changing job market.

Even in the new, knowledge-based economy, education is more than vocational training. Beyond preparing Canadians for success in the job market, the educational system should help prepare Canadians to live successful lives. To do this, we must learn:

- to take increasing responsibility for the quality of our lives (e.g. through lifestyle choices that positively affect personal and family health and welfare);
- to participate as citizens in an ever more complex and interdependent world at whatever level we chose, from community to country; and
- to acquire the skills and make the time to enjoy the benefits of our growing wealth – in leisure, recreation and the pursuit of personal interests, as individuals or with others.

***Words from Canadians...***

"I live in southeastern rural Manitoba, about 100 kilometres south of Winnipeg. I am close to Winnipeg but light years away in terms of being able to access affordable high-speed Internet. I am working on completing my BA through the University of Manitoba and often rely on the Internet for research and to access courses. The Internet lines available to me are soooo slow – well, it's actually painful sometimes. We also farm and use the Internet in that capacity as well.

"On behalf of all rural Canadians who benefit from accessing the Internet, please make affordable high-speed Internet access a reality as soon as possible. In fact, our very remoteness from libraries and other research facilities makes Internet access more critical than ever. The Internet is a wonderful way to improve our access to current information."

**Gloria Wiens, Rural Manitoba**

"I farm in southwest Saskatchewan ranch country where access to all 'developed' things is an issue: no hospital for 30 miles, treacherous roads to get there, schools are continually farther away and have less resources, business support expertise such as veterinarians or crop specialists are all growing distant. Even so, there are many with much farther to go than I. The issue is that each of these things (and many more) are going to be profoundly affected by high-speed Internet. It really changes everything. Dial-up access is great for reference and improved communication, but the fundamental aspects of health, education and business simply require broadband media to be effective."

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In transforming our learning systems, special attention must be paid to the needs of rural, First Nation and Inuit communities. As noted above, systematic gaps in educational achievement divide these communities from their urban counterparts. A number of factors contributed to these gaps.

- Differences between the economies of rural and urban areas gave rise to different learning needs and expectations, differences that persist to this day because of the structural difference between the old economy that still predominates in rural Canada and the new economy which dominates the economic life of cities.
- In addition to the cost of hiring teachers, providing access to learning opportunities traditionally has involved large, up-front, capital expenditures – in building schools and libraries, in buying books, periodicals and other learning support materials. Providing access to learning opportunities has also traditionally involved significant ongoing operating, maintenance and professional development expenditures. These capital and operating cost requirements typically resulted in significant differences between the quality of education provided in urban and rural areas, differences that stemmed not only from different needs and expectations, but from differences in ability to pay.
- Institutions providing advanced learning opportunities through formal education, ongoing professional development or cultural appreciation were almost exclusively city-based, as were jobs for knowledge workers.

The traditional approach to solving these problems (leaving aside distance education, including correspondence courses and educational broadcasting services) was for young people who wished to pursue learning opportunities to leave the country and migrate to the city. In the new economy, however, this is no longer a viable strategy for several reasons.

- The rise of the new economy does not mean that Canada no longer needs the products and services provided by rural Canada. The products of our primary industries (mining, oil and gas, forestry, farming) and the services provided by rural Canadians (particularly tourism) are a very important part of our industrial output, and are increasingly subject to global competition. Social policy considerations aside, it is therefore imperative for Canada to ensure that the industries based in rural Canada are moved from old ways of operating into the new ways of the new economy.
- Although the population of rural Canada is growing more slowly than that of urban Canada, it is growing nonetheless, in part because the inflow of young people from rural to urban areas is at least partially offset by an outflow of city dwellers to the countryside. Many of these new rural residents are well-educated, highly paid knowledge workers who are seeking a better quality of life for themselves and their families than they can find in a city environment. The high technology industries in particular, which are at the heart of the new economy, tend to favour "greenfields" locations, which can provide lifestyles attractive to highly skilled professionals.

Closing the learning gap that divides rural, First Nation and Inuit communities from the rest of Canada should therefore be an integral element of our national strategy for the new economy.

## Providing Health Care for an Ageing Population

In an unpredictable world, one of the few things we can claim to know about the future with certainty is that the Canadian population is getting older, and that the cost of providing health care is therefore likely to increase at the same time as the resources available to fund health care are under pressure for a variety of reasons.

### *Networks and Nation Building: Back to Basics*

**Networks: The Conquest of Space and Time**

Modern nations are built on networks – transportation networks that carry goods and people, energy networks that carry fuels and electricity, and communication networks that carry information, ideas, knowledge and works of imagination (see Figure 10).

The main function of networks, whatever they carry, is to overcome barriers to a nation's economic, social, cultural and political life – barriers that result from the creation of physical distances, and the time it takes to cross these distances.

From the time people first came to the country we now call Canada until little more than a century ago, transportation networks provided links between our peoples and were the foundation of our nation-building efforts. Although they became more sophisticated over time, as canals were overlaid on rivers and lakes and roads were overlaid on trails, these networks followed the waterways that had linked Aboriginal peoples for millennia, before the arrival of European settlers.

For generations of Canadians, the vital role played by transportation networks in nation building was symbolized by the construction of the Canadian Pacific Railway. Looking back, we can see that the completion of this railway in 1885 also represented the end of the era in which nation building depended, above all else, on the construction of transportation networks.

The last two decades of the 19th century and the first two decades of the 20th century witnessed a remarkable series of technological innovations. These innovations gave birth to new kinds of networks and new kind of relationships between transportation, communications and energy.

Throughout the 20th century, the building of trans-Canadian networks in communications, transportation and energy was a central element of our nation-building strategy, a uniquely Canadian process that involved all levels of government and the private sector.

**The Death of Distance?**

As a result of these nation-building efforts, the blank areas that existed in the map of Canada have been filled in, and increasingly tighter links have been established between even the remotest communities and our great metropolitan centres.

In spite of this progress, physical distance still exercises a powerful, determining influence on Canadians' access to economic, learning and health care opportunities. As we have seen, there is a systematic gap that divides the quality of life available to residents of rural, First Nation and Inuit communities from that available to residents of urban communities.

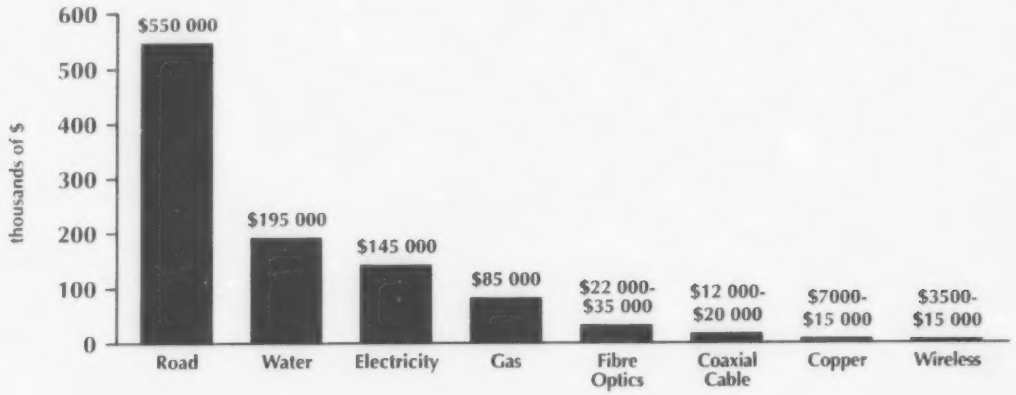
The advanced communication networks that underlie the new, knowledge-based economy provide enormous potential to reduce distance and time substantially as factors in access to these opportunities – and perhaps even to eliminate them in some areas.

If we are able to devise strategies to do this – by providing e-health and e-learning services to rural, First Nation and Inuit communities, and by encouraging the private sector to transform rural traditional industries and services into networked enterprises – we will go a long way toward reducing the gaps that divide rural and urban Canadians.

In addition to helping us address the urban-rural QOL divide, the networks that provide the foundation for our new economy have the potential not only to improve the productivity of all industry sectors, but also to improve the operation and management of the other networks that underpin our economy and society, with quality of life benefits for all Canadians.

**FIGURE 10**
**Broadband Infrastructure Costs Less Than Other Infrastructure**

Cost per kilometre*




*The source for the road, water/sewer, gas and electricity infrastructure costs was the City of Kingston and Suntac Construction, while the costs for telecom infrastructure came from Cisco Systems. Costs will vary depending on specific circumstances.

Source: Upper Canada Net

Some of the main challenges facing Canada's health care system are:

- to empower Canadians to live long and healthy lives (through improved nutrition, exercise, stress management, etc.);
- to improve the efficiency and effectiveness of caregivers;
- to enhance the quality of specialized care through the application of advanced technologies; and
- to pay for these services.

Just as in the case of economic and learning opportunities, we found that systematic gaps in access to health care divide rural, First Nation and Inuit communities from Canadians living in urban areas.

Although there are important differences in the challenges we face in transforming our learning and health care systems, we believe that there are important similarities in the reasons for these systematic differences. Moreover, the rise of the new economy requires us to close these gaps not only on grounds of social equity, but also as part of our effort to ensure that Canada is able to compete and prosper in the face of global competition.

- The costs of health care – by which we mean the capital investments required to establish health care facilities, the professional and other staff costs associated with providing health care services, and the ongoing operating, maintenance and upgrading costs required to maintain levels of service that meet steadily expanding needs and expectations – are becoming difficult, if not impossible, to justify on a community-by-community basis in rural Canada. This appears to be the case whether the health care facilities in question are hospitals, clinics or even doctor's offices.
- It has also become increasingly difficult to attract health care professionals to practise in rural areas for a variety of reasons.

As in the case of learning, the main justification for taking action to close the health care gap between rural and urban Canada is humanitarian and lies in Canada's commitment to provide universal and affordable access to health care services for all our citizens.

In addition, as in the case of learning, it is clearly important to close this gap between urban and rural Canada to maintain the viability and competitiveness of traditional rural industries in the new economy and to provide an attractive environment for new industries and new migrants to rural areas.

In the new, knowledge-based network economy, the old boundaries that distinguished economic and social policy are fast disappearing, and it is becoming increasingly difficult to dissociate the three main elements of quality of life.

Canada's strategy for the new economy should be to establish a "virtuous circle" between the generation of wealth, learning and health – a circle that encompasses all Canadians wherever they live. If we fail to do so, each of these pillars of our national life is likely to suffer, and our national whole risks being less than the sum of its parts.

## 2.3 Connecting Community and Nation

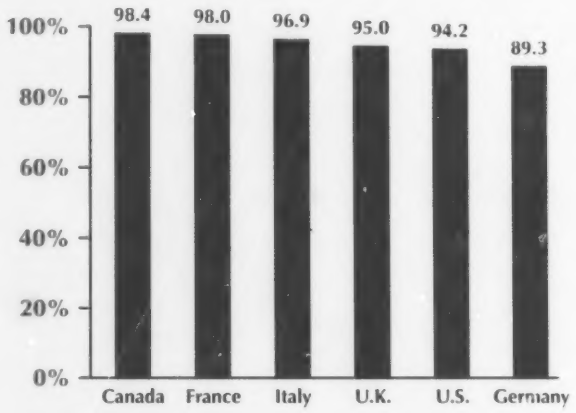
If communication networks are the fundamental infrastructure of the new, networked economy, Canada is well placed to be a world leader.

Canada has a long history of communications achievements:

- 1876 – Alexander Graham Bell made the world's first long distance telephone call from Brantford to Paris, Ontario;
- 1901 – Guglielmo Marconi received the first transatlantic wireless message at Signal Hill, St. John's, Newfoundland;
- 1906 – Reginald Fessenden made the first radio broadcast of voice and music;
- 1972 – Telesat launched the world's first geostationary domestic communications satellite system;

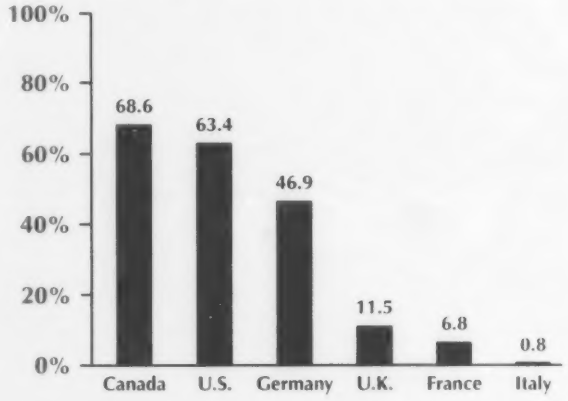
**FIGURE 11**
**Canada Ranks First in G7 in Telephone and Cable Penetration**

Percentage of Households with Telephone Service, 1998




*Source: World Telecommunication Development Report, ITU, 1999*

Percentage of Households with Cable TV Subscribers, 1998*

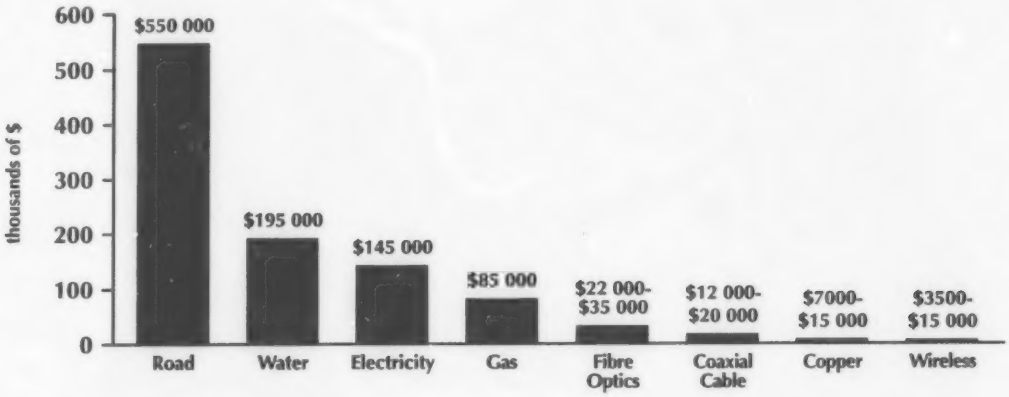



*Estimates
*Source: World Telecommunication Development Report, ITU, 1999*

- 1999 – Canada was the first country to connect all its schools and libraries to the Internet; and
- 1999 – CANARIE inaugurated the world's first and fastest all-optical national network, CA*Net.

**FIGURE 10**
**Broadband Infrastructure Costs Less Than Other Infrastructure**

Cost per kilometre*




*The source for the road, water/sewer, gas and electricity infrastructure costs was the City of Kingston and Sunrae Construction, while the costs for telecom infrastructure came from Cisco Systems. Costs will vary depending on specific circumstances.*

*Source: Upper Canada Net.*

Some of the main challenges facing Canada's health care system are:

- to empower Canadians to live long and healthy lives (through improved nutrition, exercise, stress management, etc.);
- to improve the efficiency and effectiveness of caregivers;
- to enhance the quality of specialized care through the application of advanced technologies; and
- to pay for these services.

Just as in the case of economic and learning opportunities, we found that systematic gaps in access to health care divide rural, First Nation and Inuit communities from Canadians living in urban areas.

Although there are important differences in the challenges we face in transforming our learning and health care systems, we believe that there are important similarities in the reasons for these systematic differences. Moreover, the rise of the new economy requires us to close these gaps not only on grounds of social equity, but also as part of our effort to ensure that Canada is able to compete and prosper in the face of global competition.

- The costs of health care – by which we mean the capital investments required to establish health care facilities, the professional and other staff costs associated with providing health care services, and the ongoing operating, maintenance and upgrading costs required to maintain levels of service that meet steadily expanding needs and expectations – are becoming difficult, if not impossible, to justify on a community-by-community basis in rural Canada. This appears to be the case whether the health care facilities in question are hospitals, clinics or even doctor's offices.
- It has also become increasingly difficult to attract health care professionals to practise in rural areas for a variety of reasons.

As in the case of learning, the main justification for taking action to close the health care gap between rural and urban Canada is humanitarian and lies in Canada's commitment to provide universal and affordable access to health care services for all our citizens.

In addition, as in the case of learning, it is clearly important to close this gap between urban and rural Canada to maintain the viability and competitiveness of traditional rural industries in the new economy and to provide an attractive environment for new industries and new migrants to rural areas.

In the new, knowledge-based network economy, the old boundaries that distinguished economic and social policy are fast disappearing, and it is becoming increasingly difficult to dissociate the three main elements of quality of life.

Canada's strategy for the new economy should be to establish a "virtuous circle" between the generation of wealth, learning and health – a circle that encompasses all Canadians wherever they live. If we fail to do so, each of these pillars of our national life is likely to suffer, and our national whole risks being less than the sum of its parts.

## 2.3 Connecting Community and Nation

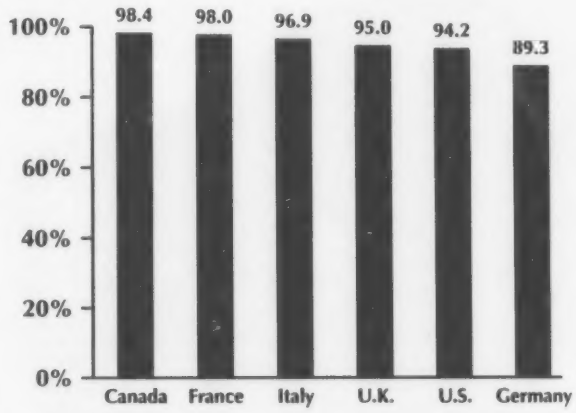
If communication networks are the fundamental infrastructure of the new, networked economy, Canada is well placed to be a world leader.

Canada has a long history of communications achievements:

- 1876 – Alexander Graham Bell made the world's first long distance telephone call from Brantford to Paris, Ontario;
- 1901 – Guglielmo Marconi received the first transatlantic wireless message at Signal Hill, St. John's, Newfoundland;
- 1906 – Reginald Fessenden made the first radio broadcast of voice and music;
- 1972 – Telesat launched the world's first geostationary domestic communications satellite system;

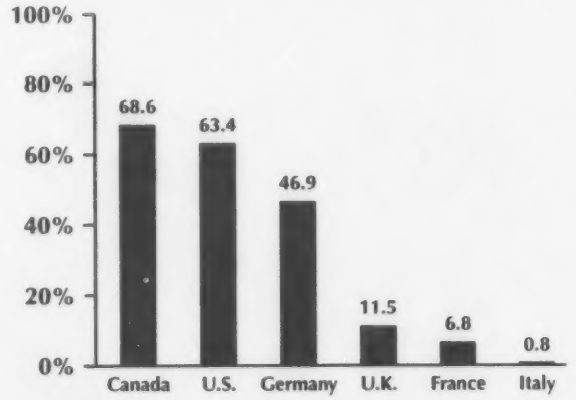
**FIGURE 11**
**Canada Ranks First in G7 in Telephone and Cable Penetration**

Percentage of Households with Telephone Service, 1998




*Source: World Telecommunication Development Report, ITU, 1999*

Percentage of Households with Cable TV Subscribers, 1998*




**Estimates*

*Source: World Telecommunication Development Report, ITU, 1999*

- 1999 – Canada was the first country to connect all its schools and libraries to the Internet; and
- 1999 – CANARIE inaugurated the world's first and fastest all-optical national network, CA*Net.

**FIGURE 12**
**Canada Ranks Second in Connectedness Index**
Summary of Connectedness Index Results for 2000

| | OVERALL | | AVAILABILITY | | PRICE | | REACH | | USE | |
|---|---|---|---|---|---|---|---|---|---|---|
| # of Indicators | 33 | | 10 | | 7 | | 8 | | 7 | |
| Weightings | 100% | | 20% | | 5% | | 25% | | 50% | |
| COUNTRY | Rank | Index | Rank | Index | Rank | Index | Rank | Index | Rank | Index |
| US | 1 | 130 | 1 | 204 | 2 | 106 | 2 | 106.8 | 1 | 114 |
| [illegible] | [illegible] | 121 | [illegible] | 181 | [illegible] | 105 | [illegible] | 106.6 | [illegible] | [illegible] |
| Sweden | 3 | 121 | 3 | 181 | 6 | 99 | 1 | 109 | 3 | 105 |
| Finland | 4 | 117 | 5 | 174 | 1 | 107 | 4 | 104 | 4 | 102 |
| UK | 5 | 115 | 4 | 180 | 10 | 89 | 7 | 97 | 5 | 100 |
| Australia | 6 | 113 | 6 | 168 | 4 | 103 | 6 | 98 | 6 | 99 |
| Germany | 7 | 108 | 7 | 161 | 7 | 98 | 9 | 94 | 7 | 95 |
| Japan | 8 | 104 | 9 | 144 | 9 | 95 | 5 | 100 | 8 | 92 |
| France | 9 | 104 | 8 | 156 | 5 | 100 | 10 | 92 | 10 | 89 |
| Italy | 10 | 99 | 10 | 130 | 8 | 98 | 8 | 94 | 9 | 90 |

*Source: Conference Board of Canada, January 2001*

In addition to these technological achievements, Canada is recognized around the world as a leader in applying communications technology to serve the economic and social needs of rural, remote and northern communities as a result of such initiatives as:

- the National Farm Radio Forum;
- the Challenge for Change and the Fogo Island Process experiences; and
- the Northern Pilot Project.

In 1997, in response to the report of the Information Highway Advisory Council (IHAC), the federal government established the goal of "making the information and knowledge infrastructure accessible to all Canadians, thereby making Canada the most connected nation in the world."

Today, we are well on our way to achieving this goal.

- Canada ranks first among the G7 group of countries (Canada, France, Germany, Italy, Japan, the United Kingdom, the United States) in the percentage of houses with telephone and cable television connections (see Figure 11).
- We are first among G7 countries in the affordability of business telephone services, and second for residential service, according to the Organization for Economic Co-operation and Development (OECD).

When all the factors that account for national connectivity are taken into account – availability, price, reach and use – a Conference Board of Canada study concluded that Canada is the second most connected country in the world, after the United States but ahead of all the other G7 countries as well as other comparator countries including Australia, Sweden and Finland (see Figure 12).

## Canadians and the Internet: World Leaders

According to the Internet Industry Almanac, Canada ranked first in the world in Internet use in 2000 with 428 users for every 1000 people, a dramatic improvement on the seventh place finish recorded just three years earlier (see Figure 13). Canada is maintaining its leadership as Internet technology evolves to high-speed access. According to a draft report by the OECD, Korea, Canada and the United States are leaders in overall broadband penetration based on

the penetration of cable modem and DSL services to provide high-speed Internet access.

A recent report on Internet use by Statistics Canada confirms this finding. On the basis of a survey done during the year 2000, Statistics Canada estimates that 13 million Canadians, or 53 percent of those aged 15 or older, used the Internet at home, at work or at some other location in the 12 months prior to the survey.

**FIGURE 13**
**Canada Ranks First in Internet Use**

Internet users per 1000 people

*Note: Internet user defined as any person over 16 who uses the Internet on a regular basis at least once a month (includes businesses, homes and schools).*

*Source: Internet Industry Almanac (September 2000).*

Among the key overall findings of the study are the following.

- At the time the study was done, personal interest was the main reason Canadians used the Internet (66 percent of respondents); work (19 percent) and school (15 percent) were distant seconds.
- Most Canadians who use the Internet are on-line, whether at home or work, for between one and seven hours per week.
- E-mail is the most popular use of the Internet; 84 percent of users connect to e-mail and 39 percent use it on a daily basis.
- The second most popular use is to search for information on goods and services (75 percent of users), although at the time the survey was done relatively few had bought on-line (24 percent) or used electronic banking services (23 percent).
- Other popular uses included accessing on-line news sites (55 percent), searching for health and medical information (46 percent), accessing information on government services (41 percent), playing games (35 percent) and using chat services (30 percent).
- The impact of the Internet is more dramatic in schools – 11 percent of respondents reported that time spent on school work had increased because of Internet use, while 82 percent reported no change and 7 percent reported a decrease.

## Canada's Digital Divide

Although Canada's overall connectivity is high and we are world leaders in the Internet, the results of this survey confirmed the existence of a "digital divide" within Canada.

In the words of Statistics Canada's report:

Internet users differ from non-users in average age, education and income. Non-users of the Internet are more likely to be older individuals and are more likely to have less education and lower household incomes

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***Words from Canadians...***

"High-speed access to the Internet is the one bit of infrastructure that shrinks our geographic isolation. It matters more than rail, road or sewer water. It is the underpinning for the new economy. Employment in the agriculture industry continues to, and will continue to, shrink. Maintenance of a critical mass of population is dependant on bridging the digital divide. These are not buzz words if you live on the other side of that divide. The very first dollar going to rural areas should be targeted to high speed, period. We will do the rest."

***Saskatchewan Respondent***
***Input from consultations conducted by the Rural Secretariat, Agriculture and Agri-Food Canada, on behalf of the National Broadband Task Force***

"Computer companies talk about the 'digital divide.' This digital divide already exists in Canada between large urban centres or populated southern communities/areas and northern or sparsely populated rural communities. This gap will continue to widen as technology and the use of technology increases. Governments need to ensure all communities in Canada have the same advantages or telecommunications infrastructure."

***Alberta Respondent***
***Rural Secretariat Consultations***

"As if to punctuate our broadband problems here, it took approximately three minutes to download your log-in page **<http://broadband.gc.ca>**, and about as long to click on any of the buttons. Welcome to the Arctic... Here in the Arctic we are destined to be marginalized in perpetuity if we don't get high-speed connectivity and increased bandwidth."

***Orin Durey, Baker Lake, Nunavut***
***Rural Secretariat Consultations***

than Internet users. Non-users are more likely to be women than men in every age group. Francophones are less likely to use the Internet than Anglophones, and those living in rural Canada are less likely to use the Internet than urban dwellers.

- When non-users were asked to identify the greatest barrier that keeps them from using the Internet, cost was cited by the largest percentage of people. Lack of access to computers or the Internet was the second most often cited barrier.
- Non-users with the lowest incomes were most likely to report cost as a barrier to the Internet use. Of those with less than $20 000 household income, 42 percent reported cost as a barrier to use, compared with the next income level of $20 000 to $29 999, where 35 percent reported cost as a barrier.
- At the other end of the scale, not having enough time is a major barrier to use for non-users earning over $50 000, and is reported by a higher percentage of non-users earning more than $80 000 than any other income group.

## The Connectivity Divide: Rural, First Nation and Inuit Communities

The digital divide in Internet access revealed by the Statistics Canada survey is a key element, but only one element of a more general connectivity divide that separates Canadians living in rural areas from those living in urban centres (see Figure 14).

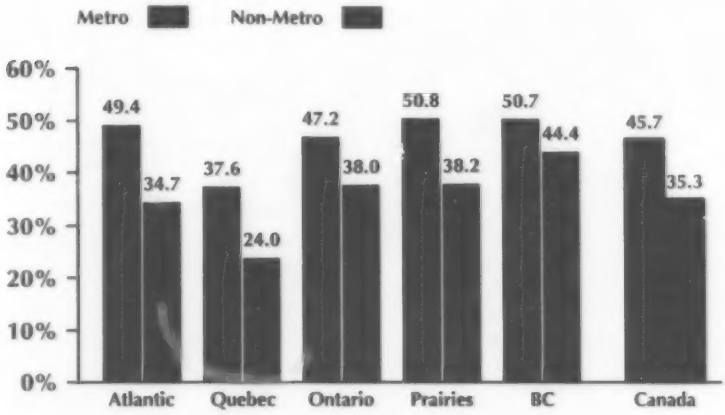
The connectivity divide is the result of a number of factors including:

- the cost of access in remote communities, particularly those that depend on satellites;
- capacity constraints stemming from the quality of rural telephone lines and cable plants;
- the relative lack of access to computers in rural areas; and
- applications and content aimed at the "mass market" that do not address the particular needs of Canadians living in rural, remote and northern communities or Aboriginal peoples.

In the new, knowledge-based networked economy, one of the keys to bridging the QOL divide that separates rural communities and Aboriginal peoples from the rest of the country – by bridging the gaps that exist in employment, income, learning and health care opportunities – is to bridge the connectivity divide.

**FIGURE 14**
**Metro–Non-Metro Use of the Internet by Households**

Regular use of the Internet by households from any location, 1999




*Metro: centres with a population of 100 000 or more.*
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*Source: Household Internet Use Survey, Statistics Canada, 1999*

Achieving this goal requires access to tools and infrastructure, either in the home or through public access points in the community. However, technical connectivity alone will not solve the problem. Bridging the QOL divide requires applications and content that address the needs of rural communities and Aboriginal peoples. More than this, it requires the involvement of these communities in designing solutions to bridge the gap.

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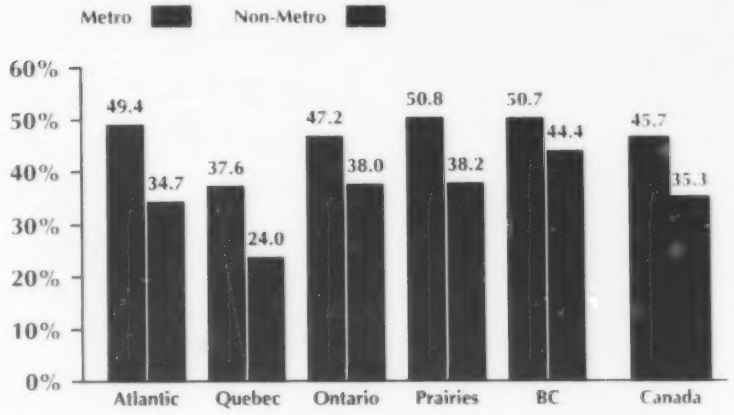


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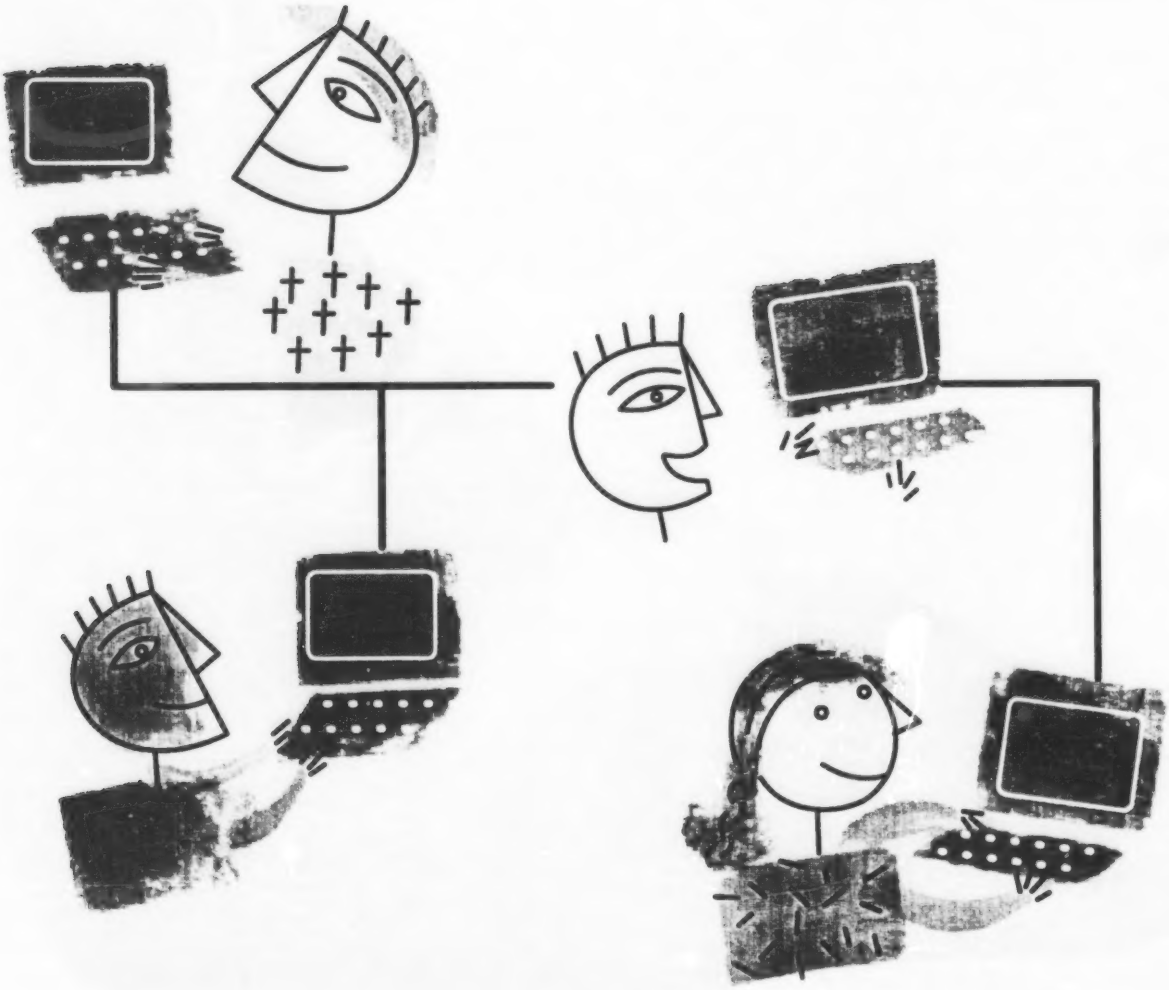
## *Part Two:*

# Networking the Nation for the Benefits of Broadband



***This report is the work of a group of people drawn from different walks of life who have different, sometimes competing, occasionally conflicting points of view on how broadband technologies can best be put in service to improve Canadians' quality of life. Fundamentally, though, it is an expression of the values they hold in common.***

The Task Force mandate is a follow-up to the Information Highway Advisory Council and parallel to similar activities addressing e-commerce, e-learning, e-health and e-government.

Wherever possible, the Task Force has tried to draw lessons and build on past successes, and develop synergistic prescriptions for future action.

## 3.1 The Task Force Mandate

On October 16, 2000, the Minister of Industry announced, on behalf of the Prime Minister, the Government of Canada's commitment to achieving the goal of high-speed broadband access to all communities by 2004, and established the Task Force to advise it on how best to do this.

On January 11, 2001, the Minister launched the National Broadband Task Force with the mandate to map out a strategy and advise the government on approaches to achieving the goal of working with all stakeholders to make high-speed broadband services available to businesses and residents in every community in Canada by the year 2004.

In particular, the Minister asked the Task Force to:

1. *Examine and report on the situation in a number of communities representing the full range of circumstances in Canada with respect to number of households, distance from existing high-speed infrastructure, institutional needs, existing local infrastructure and infrastructure soon to be available. From this examination, the Task Force would consider and advise on the following:*
   - *given the recent Canadian Radio-television and Telecommunications Commission (CRTC) decision regarding access to basic telephone service and low-speed Internet access, consider the types, characteristics and needs of communities which without government involvement will not likely be served by high-speed broadband Internet access by the private sector by 2004;*
   - *the technical, institutional and financial barriers that may delay the provision of such service by the private sector;*
   - *the roles that governments might play in overcoming the barriers;*
   - *the carriers and other commercial organizations who may be receptive to deploying high-speed service in these communities and what government would need to do to bring them to the table;*
   - *take into consideration the recent CRTC decision (99-16) regarding access to basic telephone service and basic low-speed access to the Internet;*
   - *the models and contractual arrangements which the government might use which are neutral with respect to technologies and maximize the role and risk taking of the private sector; and*
   - *whether or not pilot projects would be useful to provide both the private sector and the Government of Canada with insights and experience that would usefully inform an approach to a broader effort and, if so, what aspects the pilots should test.*
2. *Advise on the rate of uptake of current high-speed Internet use that would result in capacity constraints in inter-regional transmission, and the role of the Government of Canada, if any, in resolving and upgrading them.*
3. *Provide other general advice as it sees fit on how the government should move toward meeting its objective.*

## 3.2 Task Force Membership, Organization and Working Methods

A list of Task Force members is presented in Appendix A.

To expedite its proceedings, the Task Force established four working groups with the following mandates:

- ***Infrastructure Working Group*** – to examine current broadband capabilities, planned developments, and the potential of new technologies, to analyze how effectively market trends are likely to respond to user needs;
- ***Social Benefits and Challenges Working Group*** – to examine the bandwidth required to deliver services such as tele-health and tele-education to communities and individuals in all parts of Canada, and analyze the social benefits that would result from the deployment of such services;
- ***Economic Benefits and Challenges Working Group*** – to examine the bandwidth required to support the development of e-commerce in all parts of Canada, and analyze the economic benefits that would result from e-business, broadband delivery of social services and the development of an industrial capability to supply broadband products and services; and
- ***Barriers and Models Working Group*** – to identify barriers to the deployment of broadband in Canada, examine models that have been implemented by the provinces and in other countries, and to identify models that will most effectively achieve the government's broadband objectives.

To support its work, the Task Force commissioned a series of background studies to examine key issues related to its mandate and invited submissions from the general public. Lists of these submissions and studies are presented in appendixes C and D respectively.

The Task Force also established a Web site (**http://broadband.gc.ca**) with a three-fold purpose:

- to provide information to the public on issues related to the development and deployment of broadband communication systems, and to keep them informed of the Task Force's progress;
- to provide a forum for public input and discussion; and
- to serve as a means of communication for Task Force members between meetings.

The Task Force held five meetings, beginning in January 2001 and finishing in May 2001.

## 3.3 Guiding Principles

As a first order of business, the Task Force crafted a set of principles to guide its work. These principles were developed by:

- assessing the likely implications of broadband communications for Canadian communities, in particular for their economic, social and cultural development and for governance at different levels ranging from the local to the national; and
- deriving principles on the basis of policies – such as those contained in the *Telecommunications Act* and the *Broadcasting Act* – that have enjoyed the support of Canadians in the past and which, in the Task Force's view, are likely to continue to enjoy this support for the foreseeable future.

### Overarching Principle

After considering the positive impact the Internet has already had in providing Canadians with improved access to a wide range of economic, learning, health care and cultural opportunities; being convinced that the broadband communications revolution has the potential to transform these and other aspects of our national life, in particular by reducing physical location as a barrier to opportunity; and noting initiatives already under way in other countries as well as in some Canadian provinces, territories, municipalities and communities, the Task Force agreed to the following overarching principle:

*We believe, as a matter of urgency, that all Canadians should have access to broadband network services so that they can live and prosper in any part of the land and have access to high levels of education, health, cultural and economic opportunities.*

### *What is our policy?*

Canada's *Telecommunications Act* states:

7. It is hereby affirmed that telecommunications performs an essential role in the maintenance of Canada's identity and sovereignty and that the Canadian telecommunications policy has as its objectives:

(a) to facilitate the orderly development throughout Canada of a telecommunications system that serves to safeguard, enrich and strengthen the social and economic fabric of Canada and its regions;

(b) to render reliable and affordable telecommunications services of high quality accessible to Canadians in both urban and rural areas in all regions of Canada;

(c) to enhance the efficiency and competitiveness, at the national and international levels, of Canadian telecommunications;

(d) to promote the ownership and control of Canadian carriers by Canadians;

(e) to promote the use of Canadian transmission facilities for telecommunications within Canada and between Canada and points outside Canada;

(f) to foster increased reliance on market forces for the provision of telecommunications services and to ensure that regulation, where required, is efficient and effective;

(g) to stimulate research and development in Canada in the field of telecommunications and to encourage innovation in the provision of telecommunications services;

(h) to respond to the economic and social requirements of users of telecommunications services; and

(i) to contribute to the protection of the privacy of persons.

### *What is "basic telephone service" in Canada?*

Canadian Radio-television and Telecommunications Commission Decision 99-16 *Telephone Service to High Cost Serving Areas.*

In Telecom Decision CRTC 99-16, issued on October 19, 1999, the CRTC set specific goals for basic local telephone service, to be achieved over time in those few areas where they were not already met:

- extend service to unserved areas;
- upgrade service levels in underserved areas; and
- maintain service levels, and ensure that existing levels of service do not erode under competition.

Recognizing that the level of telephone service throughout Canada is very high, the CRTC identified a basic level of service which should be available to all Canadians, and took steps to ensure that, over time, that basic level of service would be made available to unserved and underserved areas. The CRTC's basic service objective includes:

- single line touch-tone access;
- the capability to access the Internet at low speed without paying long-distance charges;
- access to 911 services;
- voice relay services for people with hearing impairments;
- directory assistance services;
- long-distance services; and
- a copy of the local telephone directory.

### First Principle: Definition of Broadband

Broadband presents an unusual policy challenge. Before the emergence of the Internet and broadband networks, it was possible for policies, regulations and standards to define types of services such as voice telephony and broadcasting in terms of specific technologies, data transmission rates and class of service. In traditional media such as telecommunications and broadcasting, the use of digital technologies has already made such technical distinctions increasingly difficult. Broadband Internet can be delivered over almost any technological platform, at variable transmission rates, while providing a full range of service applications. Indeed, the combination of digitization, data compression and new network technologies has enabled rapidly increasing data transmission rates.

The Task Force therefore concluded that:

*The definitions of "broadband services," "broadband networks" and related concepts should be dynamic and should encompass and reflect changes in technology, applications and the needs of individuals and the potential of broadband to yield great economic and social benefits for Canadians.*

### Second Principle: Social, Cultural and Economic Benefits

Based on the information it has examined and discussed, the Task Force believes that broadband communications will significantly improve the delivery of education, training and health care services, particularly in rural and remote communities; that it will generally improve the efficiency and effectiveness of the delivery of government services, and help to revitalize the political process at all levels of government; and that it will provide significant new business opportunities, both for the value chain (B2B) and products and services for consumers (B2C).

The Task Force therefore concluded that:

*All Canadians should have access to the social, cultural and economic benefits delivered through broadband networks in such application areas as e-learning, e-health, e-government and e-business.*

### Third Principle: Capacity To Realize Benefits

There is much evidence from previous technological revolutions to suggest that the deployment of broadband technology is a necessary but not sufficient condition to reap the benefits of broadband. Unless content and services are available and people have the capacity to use, apply and adapt these services, these benefits will not occur.

The Task Force noted that Canadian policies in telecommunications, broadcasting and the cultural industries have long promoted the parallel development of infrastructure, content and services in both electronic and traditional media.

We therefore concluded that:

*Recognizing that the primary mandate of the Task Force lies with infrastructure development, accessibility also involves the parallel development of content and services, and individual and community capacity.*

### Fourth Principle: Equitable and Affordable Access to Broadband

The cost of deploying broadband networks will vary considerably among Canadian communities. In a significant number of communities, the cost of connecting to national broadband networks is likely to be so high, in comparison to the capacity of institutions, businesses and individuals in those communities to pay, that it is unlikely that the market will serve those communities.

We noted that Canada's telecommunications policy includes as one of its objectives "to render reliable and affordable telecommunications services of high quality accessible to Canadians in both urban and rural areas in all regions of Canada." In pursuing this objective, the federal government has relied on a combination of competitive market forces, regulation where it is required and targeted programs which have helped stimulate demand for and access to advanced services. These programs have included funding for CANARIE, SchoolNet, the Community Access Program, VolNet and Smart Communities. In addition, both the federal and provincial governments

have made financial contributions to assist in the deployment of telecommunications infrastructure.

Accordingly, the Task Force concluded that:

*All communities, institutions, businesses and individuals in Canada should have equitable and affordable access to broadband services and to the widest possible range of content and service providers.*

Achieving the ends identified above will require contributions from many stakeholders, including all levels of government, public institutions and communities, as well as a range of private sector organizations. The next three principles are an attempt to capture the required spirit of partnership and collaboration.

### Fifth Principle: Role of Communities

There are significant differences in the characteristics of Canadian communities that are unlikely to be served by the market. The needs of First Nation and Inuit communities are different from those of other rural and remote communities. Even within First Nation, Inuit, rural and remote communities, there are major differences in terms of geography, demography and economic activity.

The Task Force noted that in recent decades, there has been a shift in government policies aimed at addressing community needs. In the past, policies were often based on top-down and one-size-fits-all approaches that aimed at reducing differences and integrating communities into the mainstream. In many cases, approaches of this kind proved disastrous to the communities involved. For a number of years, it has been recognized that a more effective approach is to work bottom-up and to involve the community in defining solutions to problems, instead of attempting to impose them from the outside.

We therefore concluded that:

***Working with other stakeholders, communities should be engaged in identifying local needs and network options, in developing capacity at the local level to use and gain value from broadband networks, and in ensuring that economic development plans and initiatives incorporate broadband services and content.***

### Sixth Principle: Role of the Private Sector

In the past in Canada, governments at the federal, provincial and municipal levels played a major role in the communications industry as monopoly service providers alongside the private sector. Today, in line with worldwide trends, Canadian governments have privatized almost all of their telecommunications holdings and created competitive markets in almost every business segment. Consumers have benefited here and in other countries from the service innovations, greater choice and lower prices that have resulted from competition. At the same time, universal access to basic service at affordable prices has been preserved for all Canadians by subsidizing service to high-cost serving areas.

On the basis of these findings, the Task Force concluded that:

*Working with other stakeholders, and operating under competitive market forces and within the evolving regulatory environment, the private sector should play a leadership role in the development and operation of broadband networks and services for Canadians.*

### Seventh Principle: Role of Governments

Access to broadband networks is widely expected to make a significant contribution to economic and social development in all parts of Canada. Moreover, there is some urgency associated with the development of broadband infrastructure because the achievement of some economic development objectives could be affected by international competition. Accordingly, we believe that the federal government, in partnership with other levels of government, public institutions, community organizations and the private sector, should continue to play a key role in the development of broadband networks and services.

Accordingly, the Task Force concluded that:

*Working with other stakeholders, governments should, in their respective jurisdictions:*

- *foster effective competition in facilities, services and content provision, as well as a climate conducive to private innovation and investment;*

- *develop an enabling and effective regulatory environment within which elements of the private sector operate;*
- *assist communities in exploiting opportunities for broadband deployment;*
- *ensure the effective utilization of broadband networks in such public sector activities as e-government, e-health, e-learning and e-research;*
- *stimulate the development, availability and use of Canadian content, including through Canada's public institutions; and*
- *promote awareness of Canadian achievements in the development of broadband infrastructure and use of broadband services.*

### Eighth Principle: Broadband Infrastructure Development Programs

It is impossible for anyone to predict how the broadband market will evolve with any degree of certainty.

Through experience over the last two or three decades, Canadian governments at the federal and provincial levels have learned that it is generally not a sound policy to "pick winners," in terms of technologies, applications or firms in rapidly evolving, technology-driven industry sectors subject to global competition. This experience has led to a general reorientation of policies aimed at supporting technology, product and service innovations, which are intended to cause minimal disruption to market forces.

The Task Force therefore concluded that any programs undertaken by governments to support the deployment of broadband infrastructure should not only be designed to take account of the value of an open and competitive market, but also:

- be sustained until market forces are sufficient to ensure provision of the services;
- cause minimum possible distortion to the market; and
- enhance effective competition.

We therefore concluded that:

*Government broadband infrastructure development programs in service of the specific ends described above as well as the general public interest, should focus on those communities where, without government involvement the private sector is unlikely to deliver such services, and should be guided by such considerations as sustainability, technological neutrality, timeliness and affordability, and the value of an open and competitive market.*

### Ninth Principle: Statement of Priority

In addressing their mandate, the members of the Task Force were conscious from the beginning of the fact that they would likely make numerous recommendations to government regarding how best to achieve the goal of broadband access to every community by 2004, and how best to capture the important economic and social benefits such infrastructure will enable.

From the outset, we decided to emphasize our collective view that, at a minimum, our recommendations and the government's response to them must ensure that the country's schools, public libraries and health centres have sustainable broadband access.

We therefore decided to phrase this goal in the form of a ninth principle:

*In defining broadband infrastructure development initiatives, governments should achieve sustainable broadband access to every public learning institution, public library, health care centre and other designated public access point in the country.*

### Associated Recommendations

*The federal government should accept the principles articulated above as a general framework for addressing the issues identified in the mandate of the Task Force.*

## 3.4 Operational Definitions of Key Terms

As a second order of business, the Task Force developed operational definitions of the key works in its terms of reference. In so doing, it was guided by two main considerations:

- to be practical in terms of the possibilities and limitations of the current broadband market, bearing in mind the goal of achieving access for all Canadians in three years' time; and
- to be idealistic in terms of future possibilities, bearing in mind the rapid evolution of broadband technology and the need to take a long view of the broadband challenge.

### Definition of Broadband

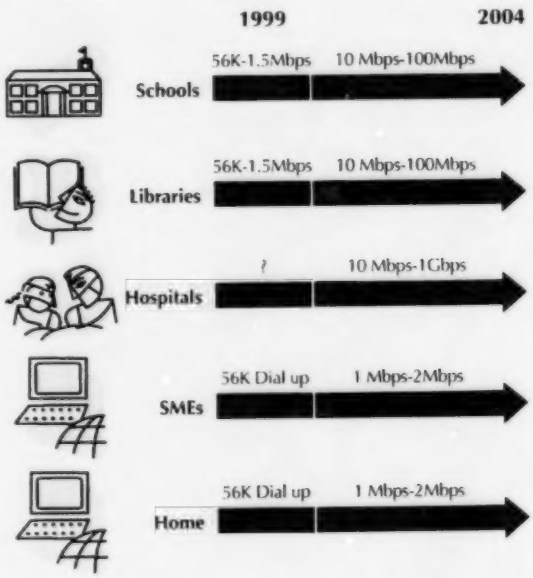
The National Broadband Task Force was established to advise government on the best approaches to make high-speed broadband Internet services available to businesses and residents in all Canadian communities by the year 2004. This initiative rests on the belief that universally fast, timely and affordable access to the Internet will yield potentially great economic and social benefits for Canadians. In other words, the greater the capacity of the Internet access infrastructure and the more accessible it is, the greater the advancement of those benefits and opportunities. This suggests that the underlying strategy to achieve this goal would be to reduce or eliminate any barrier that may constrain the supply of affordable bandwidth on demand for all.

Defining the term "broadband" is a challenge. Indeed, we find that there are as many definitions of broadband as there are countries that have tried to define it. Moreover, in the rapidly evolving technology environment of the Internet, high-speed broadband is a moving target that is likely to mean different things next year or the year after. For example, the capacity of the existing copper (telephone), coaxial (cable television) and satellite infrastructure is expected to continue to evolve, driven by technology and market forces, to provide Internet access speeds comparable to, or even exceeding, the Task Force's definition of broadband. In the circumstances, our views are obviously rooted in today's understanding of technology and applications.

Accordingly, we have adopted the following definition to guide our work (see Figure 15):

*Based on today's technology and applications, high-speed broadband is defined as a high-capacity, two-way link between end user and access network suppliers capable of supporting full-motion interactive video applications delivered to all Canadians on terms comparable to those available in urban markets by 2004. A minimum*

**FIGURE 15**
**Estimated Bandwidth Requirements for Selected Users**




*Source: Estimated by Broadband Task Force.*

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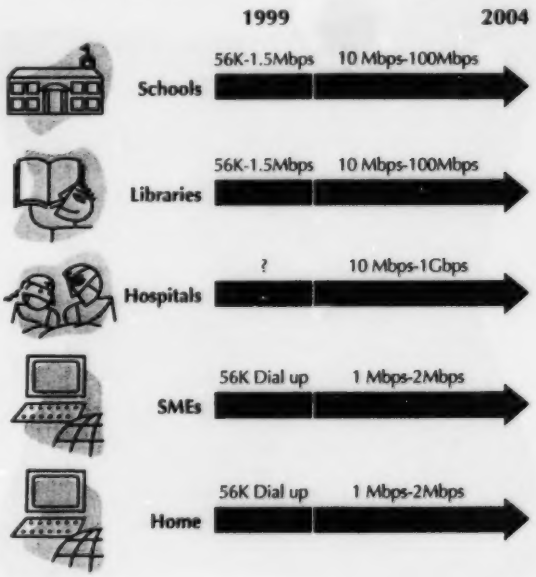



*Source: Estimated by Broadband Task Force.*

*symmetrical speed of 1.5 megabits per second per individual user is currently required to support these applications. Leading up to 2004 and beyond, new applications such as peer-to-peer file interactions and video conferencing will increase individual user demand for symmetric bandwidth in the 4 to 6 Mbps range. Public and commercial facilities will require much higher bandwidth ranging from this minimum to several hundred times more bandwidth, depending on their size and user needs.*

### Definition of Community

The term "community" can refer to communities that have a geographical basis, or to communities that share the same interests without necessarily sharing the same physical space. The Task Force's terms of reference clearly envisage the former kind of community. As a practical matter, it is much easier to identify geographical communities unlikely to be served by the market by 2004 than it is to identify communities of interest that are unlikely to be so served.

This being said, it is also likely that many of the most significant benefits of the broadband revolution – which will reduce and may even eliminate space and time as determining factors in human existence – will be achieved through service to communities of interest.

The Task Force therefore adopted the following definition of community:

*For the purpose of the Task Force's mandate, a community can be defined as a locality which, among other things, has the following attributes: a name, a distinct physical location and territory and a population. This definition should be used in conjunction with Statistics Canada's census data to identify communities where broadband services are unlikely to be available without government intervention.*

*For purposes of program implementation, it is recognized that not all communities meet these definitions and that flexibility will be required in applying these definitions, particularly considering the views of other stakeholders (i.e. levels of government).*

*The definition of community is geographic for purposes of defining infrastructure gaps. However, it is fully acknowledged that the application and benefits of broadband will encompass communities of interest.*

## 3.5 Strategic Approach

To respond to the nation-building challenges facing Canada, and to take full advantage of the revolutionary potential of broadband technology, we believe that a two-track, multi-phase approach is needed.

### Track One: Access to Broadband Infrastructure

In the first phase, action should be undertaken in partnership by all levels of government, the private sector and other stakeholders to ensure that all Canadians living in communities unlikely to be served by the market have access to broadband services by 2004.

### Track Two: Creating an Environment That Fosters Innovation and Use

In parallel with the first phase of broadband infrastructure deployment, all levels of government, the private sector and other stakeholders should work in partnership to create an environment that will foster innovation in technology, applications and content development, support and encourage the use of broadband applications and technologies, and enable Canadians, businesses and community institutions, including voluntary organizations, to take full advantage of the potential of broadband technologies.

The following chapters present our analysis of the key issues involved in implementing this two-track approach and our recommended priorities, strategies and actions, along with their financial consequences.

***This report is about an end point – how to ensure that all Canadians have access to broadband services by 2004. It is also about the beginning of a journey that will last for decades and whose destination is unknown.***

In developing an action plan to ensure that all Canadians have access to broadband services by 2004, the Task Force was guided by three fundamental considerations.

- There are significant differences in the needs, expectations and capacities of Canadians living in different communities and in different parts of the country, reflecting the diversity and richness of our history, economy, society and culture. As in every other area of Canadian life, we found that one size will not fit all – nor should it. We believe that communities should be given the opportunity to develop broadband solutions that fit their needs, and that it would be wrong to attempt to impose a uniform model.
- At the same time, the goal of ensuring that all Canadians have equitable opportunities to share in the economic and social benefits of broadband requires that all the elements that go to make up Canada's national broadband networks are integrated into a seamlessly interconnected and interoperable whole that provides access to comparable levels of at least basic service to individuals, businesses and public institutions, regardless of location.
- We are not starting with a blank sheet of paper. The broadband revolution has already begun in some communities and in many provinces. This gives the Task Force the great advantage of learning from those who have already taken action, learned lessons and developed strategies for connecting Canadians to broadband networks and services. We are very grateful to the pioneers who have made our task considerably easier.

## 4.1 The Broadband Frontier: Communities Beyond the Market's Reach

A first step in defining the extent of challenge in connecting all Canadian communities by 2004 is understanding density and distribution of the Canadian population. The challenge in meeting our goal is that while a majority of the population is highly urbanized, a minority is widely dispersed over vast areas. Urban and suburban centres account for 83 percent of the population, but only 29 percent of total communities, that is 1720 of 5984 communities. The remaining 17 percent of the Canadian population is highly dispersed, spread over 4264 communities.

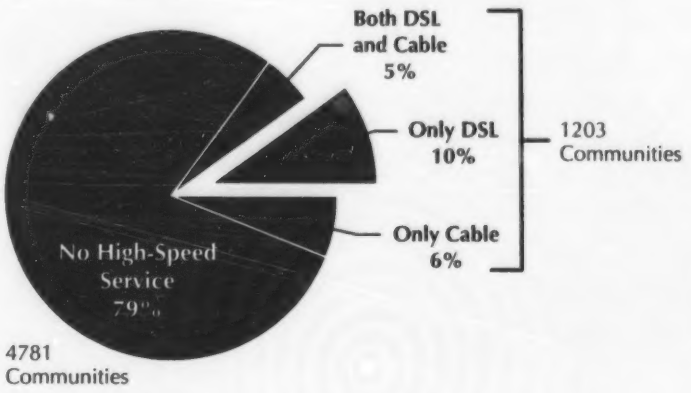
Statistics Canada has classified census subdivisions by proximity to metropolitan centres – the metropolitan influenced zone (MIZ). This classification is useful in determining degree of population dispersal. There are five zones in total, classified by strength of the metropolitan influence.

- **Urban** (Census Metropolitan Area/Census Agglomeration): These are census sub-divisions (CSDs) or communities that are part of a census metropolitan area or census agglomeration (CMA/CA). There are currently 1049 urban communities representing 77.8 percent of the population. Examples of these types of communities would be Edmonton, Alberta, and St. John's, Newfoundland.
- **Suburban** (Strong MIZ): These are CSDs or communities where at least 30 percent of the total employed labour force living in the CSD works in any CMA/CA. There are currently 670 suburban communities representing 5.4 percent of the population. Examples of these types of communities would be Stonewall, Manitoba, and Shediac, New Brunswick.

- **Outlying communities** (Moderate MIZ): These are CSDs or communities where between 5 and 30 percent of the total employed labour force living in the CSD works in any CMA/CA. There are currently 1573 outlying communities representing 8.2 percent of the population. Examples of these types of communities would be Cache Creek, British Columbia, and St. Mary's, Nova Scotia.
- **Far outlying communities** (Weak MIZ): These are CSDs or communities where more than 0 percent but fewer than 5 percent of the total employed labour force living in the CSD works in any CMA/CA. There are currently 1096 far outlying communities representing 7.35 percent of the population. Examples of these types of communities would be Chapleau, Ontario, and Tignish, Prince Edward Island.
- **Remote communities** (No MIZ): These are CSDs or communities which have fewer than 40 people in the resident labour force or no people commuting to work in any CMA/CA. There are currently 1595 remote communities representing 1.2 percent of the population. Examples of these types of communities would be Fort Rupert, Quebec, and Cumberland House, Saskatchewan.

From this analysis, it is clear that there cannot be anything even remotely approaching a one-size-fits-all solution to the problem of ensuring broadband access for Canadians unlikely to be served by the market. Canada's communities have very different needs and capacities. Some are "broadband ready" and will need only minimal support. In others, the challenge is much greater.

**FIGURE 16**
**Approximately Three Quarters of Canadian Communities Do Not Have High-Speed Access**




*Communities refer to Statistics Canada Census Sub-division (CSD) breakdown.
Source: Industry Canada estimates based on 1996 population data from Statistics Canada and confidential company information.

## Sizing the Problem

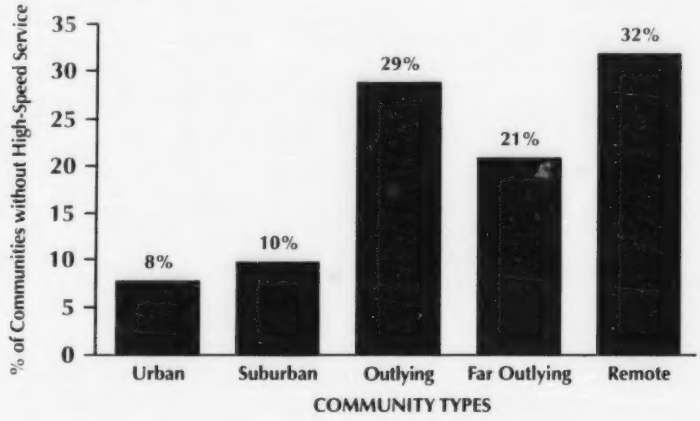
Which Canadian communities are unlikely to obtain access to high-speed broadband service by 2004 as a result of market forces alone? What percentage of the Canadian population do these communities represent?

To answer these questions, the Task Force conducted a baseline study with the assistance of major telephone companies and the Canadian Cable Television Association to determine current gaps in the availability of high-speed services. For this analysis, rollout of the asynchronous digital subscriber line (ADSL) service offered by telephone companies and the high-speed service offered by cable companies were considered high-speed service.

The results of the study should be used in only the broadest context: while they are sound given the available data, there are limitations, the most important being the classifying of an entire community as having high-speed service if some part of the community had high-speed service available. Another caveat is that the final results can only be as good as the input data. Specifically, incomplete surveys or

**FIGURE 17**
**Urban Proximity* (MIZ) of Unserved Communities**

No Access to High-Speed Service – 4781 Communities

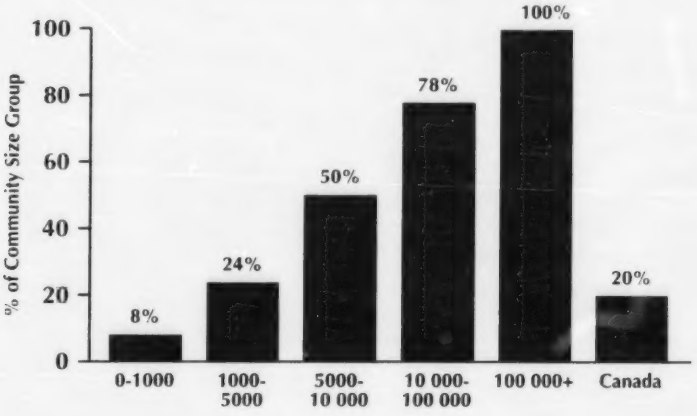



*Proximity is based on Statistics Canada's Census Metropolitan Area Influenced Zones (MIZ).*

*Source: Industry Canada estimates based on 1996 population data from Statistics Canada and confidential company information.*

**FIGURE 18**
**Smaller Communities Are Less Likely To Have High-Speed Access**

Access to High-Speed Service – 1203 Communities*

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*Source: Industry Canada estimates based on 1996 population data from Statistics Canada and confidential company information.*

inaccurate mapping could result in communities which actually have service being missed and, conversely, communities which do not have high-speed service being labelled as having high-speed service.

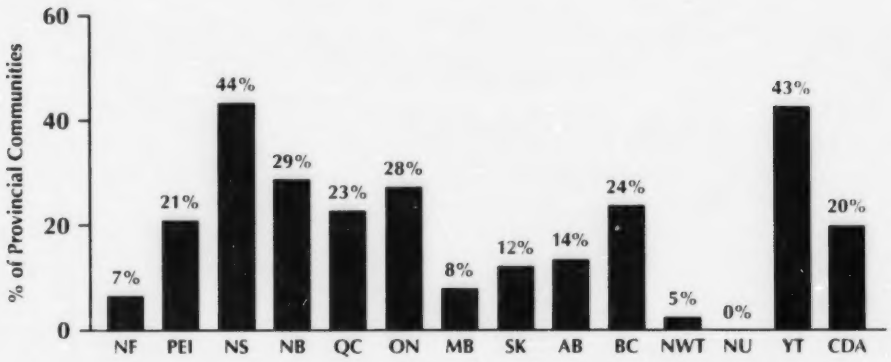
The studies revealed that approximately three quarters of Canadians living in about a quarter of Canadian communities currently have access to high-speed services. In fact, approximately half of all Canadians actually have a choice in their type of high-speed service.

Conversely, three quarters of Canadian communities, home to approximately a quarter of the Canadian population, do not have access to the high-speed services currently offered by cable and telephone companies (see Figure 16). Of the communities without high-speed access, most are in weaker metropolitan influence zones, being either outlying, far outlying or remote communities (see Figure 17).

It was also found that community size played a role in the availability of service. Specifically, Canadians who live in larger communities tended to have access to high-speed service (see Figure 18). In addition to differences between communities of different sizes, there were differences in availability of high-speed service by province and territory (see Figure 19).

**FIGURE 19**
**Access to High-Speed Service Varies by Province**

Access to High-Speed Service - 1203 Communities*

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## 4.2 The Broadband Pioneers

### Community and Municipal Initiatives

Broadband is not the first communications revolution that has ever taken place in Canada. It is only the latest development in a series of cycles that began with the invention of the telegraph in the 1840s. And, as has been the case in every previous communications revolution, individual communities across Canada have been the true pioneers in adopting broadband technology to serve their members and satisfy needs that are not being met through established networks and media.

Today, for example, we rightly think of our telecommunications, broadcasting, cable television and satellite networks as national networks extending from east to west and north to south, reaching into and linking every community in the country. But it was not always so.

- The Canadian telephone network was built bottom-up. As is invariably the case in any communications revolution, the dawning of the telephone era in the 1870s was marked by competition between different technologies and different companies. Although Parliament granted Bell Canada the right to serve the whole country in 1880, the different needs of different regions of the country quickly undermined the notion that there could be a single solution for the country as a whole. In succeeding decades, individual communities, private companies and provinces built telephone networks in response to local, regional and national needs. The result was a mixture of private and public networks operating within, across and among federal, provincial, territorial and municipal jurisdictions that was unique in the world – both in its complexity and its success in delivering universal access to basic telephone service at affordable prices – the "holy

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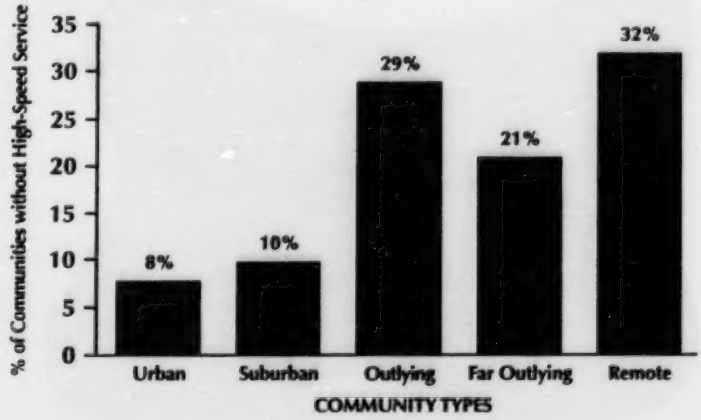


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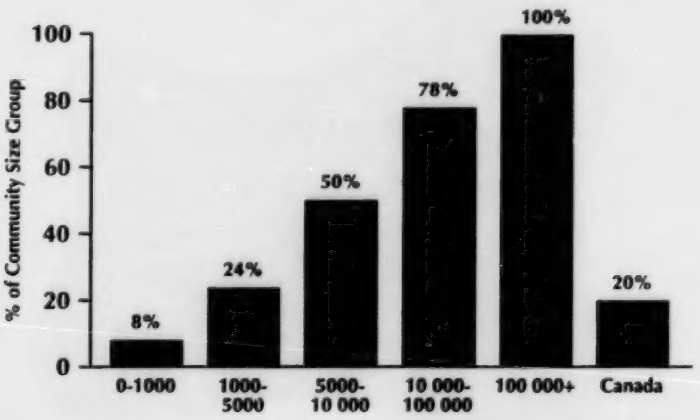


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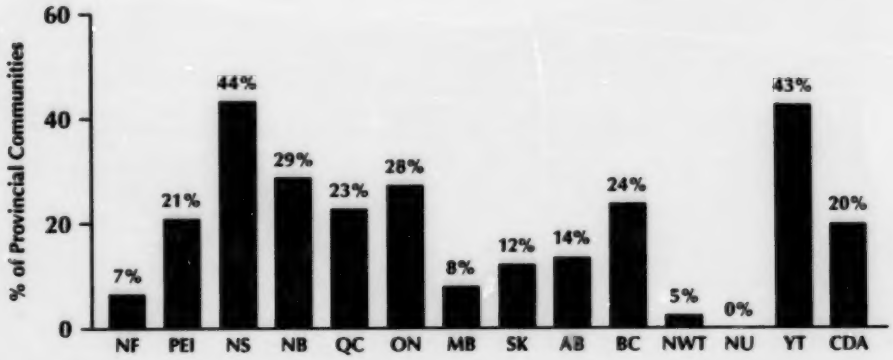


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- The Canadian telephone network was built bottom-up. As is invariably the case in any communications revolution, the dawning of the telephone era in the 1870s was marked by competition between different technologies and different companies. Although Parliament granted Bell Canada the right to serve the whole country in 1880, the different needs of different regions of the country quickly undermined the notion that there could be a single solution for the country as a whole. In succeeding decades, individual communities, private companies and provinces built telephone networks in response to local, regional and national needs. The result was a mixture of private and public networks operating within, across and among federal, provincial, territorial and municipal jurisdictions that was unique in the world – both in its complexity and its success in delivering universal access to basic telephone service at affordable prices – the "holy

grail" of the era when plain old telephone service (POTS) was the only choice available to most consumers, and most market segments were served by monopolies.

- The Canadian cable television industry was also built bottom-up, beginning with the community antenna television (CATV) systems originally built in rural areas to give residents access to the same range of television services – including U.S. imports – that were available in urban areas. Until a decade or so ago, there were hundreds of different community-based cable television companies operating in Canada. It is only recently that they have been consolidated into something beginning to resemble a national network, controlled by a limited number of players.
- The history of the Canadian satellite broadcasting industry has followed a similar path. It was the widespread use of earth stations in rural and remote areas of Canada to capture U.S. satellite broadcasting signals that eventually precipitated the creation of Canadian satellite broadcasting networks. These networks provide Canadians with a legal and competitive satellite alternative to terrestrial cable television systems and a ready-made platform for one-way, and eventually two-way, Internet access.

True to this history and tradition, a number of Canadian communities and municipalities have been pioneers in bringing broadband communication services to their residents.

The achievements of these communities should be taken into account in developing a strategy to ensure that all Canadian communities have access to basic broadband service (BBS) by 2004. They provide a living laboratory for learning lessons that may be shared by others, and an integral element of the national broadband plan.

### *Upper Canada Networks – A community-based initiative*

In 1996, the South Grenville Economic Development Commission launched the Telecommunications Task Force to address the connectivity issues in their four communities. South Grenville is in commuting distance to Ottawa-Carleton, the home of "Silicon Valley North." The Task Force quickly discovered that access to affordable, high-speed Internet service was virtually non-existent and very much in demand by the public, by private sector enterprises and by the majority of residents in this predominantly rural area.

In a matter of months, it became apparent that to be successful, this local initiative had to scale up to involve the entire county of Leeds and Grenville. The federal government funded an economic development program called the Upper Canada Economic Renewal Project. It was through this program that the connectivity issue was able to expand its scope and become a county-wide initiative.

In 1998-99 a thorough market needs analysis was completed, and a business case developed to the point where the now expanded Task Force was able to approach the Ontario Ministry of Energy, Science and Technology (MEST) for funding from their Telecommunications Access Partnership (TAP) program.

In the first quarter of 2000, MEST awarded a grant of $1.8 million to build a wireless network throughout the county to provide affordable access to broadband connectivity to the public and private sector enterprises and the general public.

Upper Canada Networks (UCNet) was formed in 2000, as a not-for-profit corporation.

UCNet has awarded a contract to a consortium of companies to build a broadband, fixed, wireless network where bandwidth-on-demand will be available to users for interactive opportunities such as data, voice and video.

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UCNet has awarded a contract to a consortium of companies to build a broadband, fixed, wireless network where bandwidth-on-demand will be available to users for interactive opportunities such as data, voice and video.

Phase I of the program will be completed during the summer of 2001. UCNet hopes that its work will serve as a model for other rural areas contemplating and requiring access to the information highway.

For further information, connect to:
**http://www.uppercanada.net**

### *Fort Severn First Nation*

Ontario's northernmost and oldest community is the Fort Severn First Nation, located on the shores of Hudson Bay, near the Manitoba border. Its rich history and unique environment are maintained and protected by the Cree people who have always lived in this special part of Canada. Broadband telecommunication services are an important part of this community's economic development strategy. Partnering with Telesat Canada, the Communication Research Centre and Industry Canada-FedNor supported the installation of a satellite digital connection into Sioux Lookout that is now providing data and video connections to various service organizations. Fort Severn community members and organizations are using these communication tools to market and promote their traditional lands and the resources they provide.

Fort Severn First Nation also participated with the other four Keewaytinook Okimakanak First Nations in an application to Industry Canada's Smart Communities Program in the summer of 1999. In May 2000, the Kuh-ke-nah Smart First Nations Demonstration project was selected as Canada's Aboriginal Smart Communities Demonstration Project. As a partner in this project, Fort Severn community members are developing a number of broadband applications that will support both individuals and the community in the future.

Visit Fort Severn First Nation on-line at:
**http://communities.knet.on.ca/fortsevern**

### *Collège de l'Acadie: Strengthening the Acadian Francophone community thanks to technology*

The Collège de l'Acadie is Nova Scotia's only Francophone community college. The college has five learning centres in Nova Scotia and one on Prince Edward Island. It offers the populations of Nova Scotia and Prince Edward Island the unique opportunity to take both technical and professional courses in the French language, in such varied disciplines as computer technology, health care, business and education.

To bring students and staff together every day despite the great distances that separate various regions of Nova Scotia and Prince Edward Island, the Collège de l'Acadie relies on innovative technology. Using various video conferencing and interactive document exchange systems, the college can meet the needs of the various regions and its dispersed student population.

These innovative ways of learning are quickly becoming part of daily life in the classroom. As students become more exposed to technology in the learning environment, it becomes an integral part of their training. Working with technology allows them to develop skills that are highly valued in the labour market and to exchange ideas and work collaboratively with students from other regions.

Broadband technology will allow the college to expand on these distance education programs, to create a truly virtual learning environment.

Visit the Collège de l'Acadie on-line at:
**http://www.ccfne.ns.ca**

## Provincial and Territorial Initiatives

As described in the previous section, the way in which telecommunication networks developed in Canada was unique in the world – and uniquely successful, as our connectivity numbers demonstrate.

History, culture, economy, society – all differ from community to community, from province to province, from region to region.

In the past, these differences have given rise to different approaches to developing communication networks. In some areas of the country, the task was entrusted to the private sector – and even to foreign-owned companies. In others, it was considered the responsibility of public authorities. In some areas, networks grew and interconnected organically. In others, they were centrally planned.

Today, on the eve of the broadband revolution, these differences are part of Canada's communications heritage – a part of our future as well as our past. Just as individual communities may want to pioneer in the development of broadband communications, without waiting for a national network to unfold, so provinces and territories intend to carry on with the strategies that have worked well for their residents in the past.

In particular, because of the enormous potential of broadband communications to improve the delivery of educational and health care services, which are provincial responsibilities, provinces want to integrate the development of broadband networks with their plans for developing these services, especially in rural and remote areas.

From a federal perspective, it is equally important to integrate the development of broadband networks in the territories and to Inuit and First Nation communities with plans for improving the delivery of services that are the responsibility of the federal government in these jurisdictions, as well as to ensure that all provinces and territories have adequate connections to the national backbone network.

In some cases, provinces and territories have already announced, and are in the process of implementing, broadband deployment strategies. The Task Force was very pleased to note that there are no inconsistencies between these plans and the strategy we recommend for the nation as a whole. In particular, there appears to be consensus that the following services should be available:

- service at least equivalent, and if possible, superior to that provided by ADSL, cable, wireless modems or dedicated satellite connections to residences and small businesses;
- 10 Mbps to small schools, libraries and health care facilities;
- 100 Mbps to large schools, libraries and small hospitals; and
- 1 Gbps to post-secondary institutions and large hospitals.

The Task Force also noted that other provinces are taking a somewhat different approach to the development and deployment of broadband networks, building from the ground up on the basis of communities, institutions or public services that already have, or are in the process of acquiring, high-speed broadband connections.

In our view, this latter approach is also reflected in the strategy we recommend for the country as a whole. In some cases, it may even help us begin to formulate a national strategy for the post-2004 period, since the capabilities that will be put in place by some communities and institutions may well exceed the targets we have set for 2004.

As in the case of community-based initiatives, our goal is to build on all provincial initiatives of whatever kind in the national strategy that we recommend, and to promote the rapid and effective sharing of information on approaches and lessons learned, so that all Canadians may benefit from the diversity that is the source of so much of our national strength.

***Provincial and territorial governments are world leaders in broadband vision and deployment***

Provincial and territorial governments have demonstrated that they share the view that rapid deployment and use of broadband is a key priority. Prince Edward Island, for instance, continues to expand the use of its broadband network. The Government of Quebec has provided accelerated depreciation for investments in rural fibre-optic transmission facilities. The Government of Ontario has joined with telephone companies and other partners to provide significant upgrades to data networks in smaller communities and rural areas.

All provinces and territories have major network initiatives in education, health and other government services, and their demand for these applications has encouraged private sector investment in infrastructure. Several provincial/territorial governments have aggregated their demands and have bundled with this aggregated package the requirement that reasonably priced, high-speed services be available to businesses and residents in all communities where such services are available to schools, health facilities or other government installations.

Yukon, Saskatchewan and Alberta provide examples of this approach. In both the breadth of their broadband vision and the extent of their coverage, these initiatives may be the most advanced undertaken by any comparable national, state or provincial government anywhere in the world. The Task Force will not be surprised if these initiatives become known internationally as the Canadian Broadband Model.

Currently, only about 30 communities in Alberta have some access to affordable high-speed residential Internet services. Alberta SUPERNET will give 420 communities that access at significantly lower rates than even slow-speed service, which may or may not be currently available. Every hospital, school, library and government facility in the province will be connected to the high-speed broadband network. The Government of Alberta will provide $193 million to the project.

Saskatchewan's CommunityNet organizes that province's public sector entities into one anchor tenant and will provide high-speed Internet access to over 366 communities, 839 educational facilities, 379 health facilities, 86 First Nation schools and 249 government offices. The overall cost of CommunityNet will be $70.9 million over the next six years. The project was developed by the Government of Saskatchewan and has had financial support from the Government of Canada (Western Economic Diversification).

The Connect Yukon project will provide interactive video conferencing capability to rural schools to support a distributed learning program, and it will provide affordable high-speed Internet access to rural businesses and homes. The Yukon government will contribute slightly more than $20 million in capital and operating costs over five years: the capital investment alone equals $560 per Yukon resident. Old Crow, which is just above the Arctic Circle, is the most northerly Connect Yukon community and the only community to be served by satellite. An article in *Forbes* magazine observed "Old Crow will be getting higher speed access than most homes in affluent U.S. suburbs."

## Initiatives in Other Countries

A study prepared for the Task Force on international public programs to provide broadband access found that, although governments around the world have taken different approaches to extending access to broadband services, all the governments studied appear to share the same general view of the implications of the broadband revolution for their economies and societies and the same objectives. In particular, there is international consensus that:

- the broadband revolution changes the nature and function of national economic activity. It creates unprecedented opportunities for citizens, groups, education, medicine, communities, companies and governments.

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- the broadband revolution changes the nature and function of national economic activity. It creates unprecedented opportunities for citizens, groups, education, medicine, communities, companies and governments.

### *Canada is not alone....*

Canada is not alone in recognizing how important it is to provide broadband access to its citizens. The Task Force surveyed national public programs in 14 countries* outside Canada that have the objective of extending broadband Internet access. Virtually every developed country and many developing countries have proposed governmental programs designed to foster or extend broadband technologies for economic growth. Some programs are extensions of existing telecommunications "universal service" or "universal access" initiatives, but more often they now focus on broad socio-economic development goals, as the technology is – now more than ever – seen as an underpinning for national growth and social development.

The Task Force found that existing national initiatives around the globe can be grouped into three broad categories, which are described here with brief examples.

1. *The "light touch" regulatory reform approach* involves minimal central government intervention, beyond a firm commitment to using public policy to achieve universal Internet access. **New Zealand** exemplifies this approach. New Zealand carried out a sweeping national review in 2000, and has decided to build on its existing "Kiwi Share" universal access program to extend at least low-speed Internet access to rural and remote areas. Discussion continues on whether to expand the program to include broadband access.

2. *The "co-operative" approach* is used by countries aiming to bridge the digital divide. It is a more activist approach. Governments in countries such as Australia, Germany, Sweden and the United States have programs to improve access to disadvantaged areas and groups where market forces alone may not deliver broadband access. **Sweden** has drawn much attention with its "Small Community Broadband Infrastructure Initiative," announced last year. It will extend access to communities with populations of less than 3000 and to the 8 percent of the population beyond the reach of other broadband services: a combined group making up 30 percent of Sweden's population. The national government will subsidize community-owned open access networks, sharing the costs with municipal governments, based on a model already operating in Stockholm (Stokab).

3. *Comprehensive national broadband planning approaches* are being adopted in countries which traditionally use interventionist public sector tools to drive and shape private sector activity and investment. Examples of this approach are found in countries such as Korea, Norway, Malaysia, Singapore and Japan. **Singapore** developed the first program of this type, called "Singapore One," which is an element of a broader "Infocomm 21" strategy designed to make the country a global leader in the information and communications industries. Singapore One began in 1996 and is now expanding to provide all citizens with access to a broadband network and advanced applications. Government has heavily subsidized the construction of the network, and additional funding is made available by government departments to deliver services, or to provide access to disadvantaged groups.

The Task Force studies of these international initiatives are available in full on its Web site at the following URL: **http://www.broadband.gc.ca**
In addition to the overview study, there are studies examining different countries' plans to achieve social and economic benefits, and a paper benchmarking Canada against six leading examples from around the world.

* *Australia, France, Germany, Japan, Korea, Malaysia, New Zealand, Norway, Singapore, Sweden, Switzerland, Taiwan, the United Kingdom and the United States of America.*

- because the new technology has no geography, every territory – no matter how remote – has the opportunity to become a creative technological hub both for inhabitants and newcomers. It can be an engine for economic growth.
- rural, remote and disadvantaged areas and groups have the most to gain from harnessing new technology.
- government matters: public policy moulds the environment in which the broadband revolution can flourish. Broadband policies are seen as an important part of overall governmental socio-economic policies.
- while the private sector drives the new revolution, without exception governments believe they have a pivotal role in providing an educational and training framework to ensure citizens are able to take full advantage of the new technologies. Skills and an educated population are central to a country's ability to succeed.

There is a common belief that governments must undertake initiatives to bridge the digital divide and that market forces alone will not rapidly extend the benefits of broadband access to remote, rural or otherwise disadvantaged groups (e.g. poorer neighbourhoods in cities, distant islands, sparsely populated territories, disadvantaged minority communities, etc.).

## 4.3 Overall Priorities

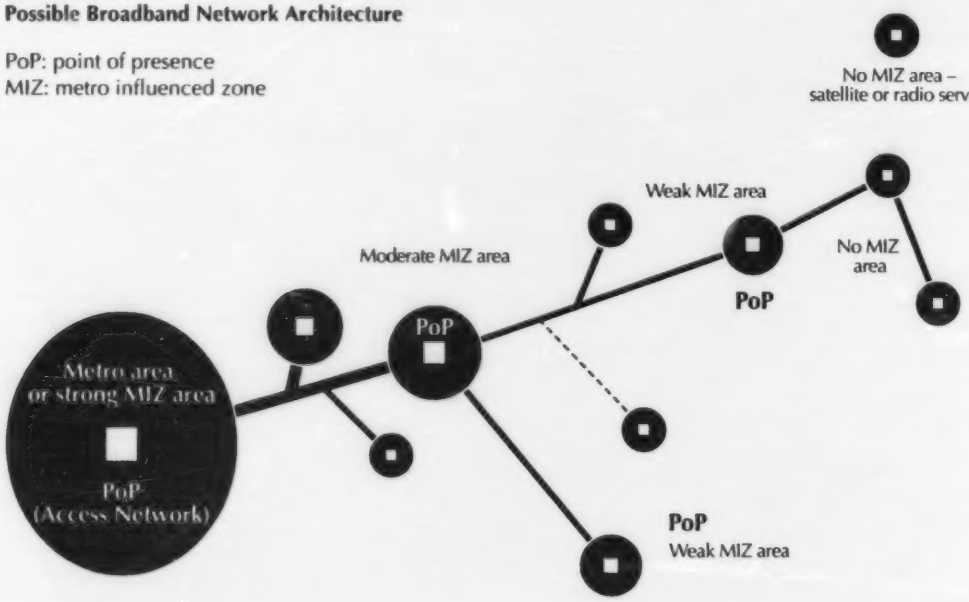
The Task Force concluded that a strategy to provide broadband access to communities unlikely to be served by the market must include the following elements:

- a plan to build a broadband transport link from the national backbone network to a point of presence within the community;
- a plan to connect public institutions in the community (e.g. learning and health care centres, and local, provincial and federal services) to the broadband network; and
- a plan to offer local businesses and residents the opportunity to connect to the broadband network from their place of business or residence.

See Figure 20 for an example of how a network could connect urban and remote communities.

**FIGURE 20**
**Possible Broadband Network Architecture**

PoP: point of presence
MIZ: metro influenced zone




*Source: National Broadband Task Force.*

Accordingly, the Task Force recommends:

***Recommendation 1: By 2004, broadband facilities and services should be deployed to and within all Canadian communities and thus be made available to all businesses and households as well as public institutions.***

### Transport Link

***Recommendation 1.1: All communities should be linked to national broadband networks via a high-speed, high-capacity and scalable transport link. This link should be capable of supporting an aggregate of 1.5 megabits per second symmetrical to each end user, as well as support a full range of higher bandwidth requirements to all users and institutions regardless of location.***

### First Nation, Inuit, Rural and Remote Communities

***Recommendation 1.2: The priority of the broadband deployment strategy should be to link all First Nation, Inuit, rural and remote communities to national broadband networks using appropriate technology. Further, access to broadband connectivity in First Nation, Inuit, rural and remote communities should be available at a price reasonably comparable to that for more densely populated areas.***

### Connecting Public Institutions

***Recommendation 1.3: The local broadband access infrastructure should be extended to the community's public facilities, including every public learning institution, public health care facility, public library and other designated public access point.***

### Connecting Businesses and Residences

***Recommendation 1.4: The local broadband access infrastructure should also be extended to local business and residential users, for example, by leveraging broadband infrastructure serving public facilities.***

## 4.4 Deployment Models for Achieving Basic Broadband Access

The Task Force has considered a wide variety of models of government initiatives to achieve the goal of broadband access. Recognizing that a focused recommendation was required, which would assist government in determining an appropriate way forward, the Task Force considered the plans of other countries, and also looked across Canada for innovative ideas and best practices that could be recommended. These various approaches were then classified into 15 possible generic models. The Task Force reviewed these generic models in the context of its mandate and the principles summarized in Chapter 3. In that context, the following objectives for the models for the deployment of government-supported infrastructure were considered especially important. These objectives are to:

- ensure third-party open access;
- ensure competitive and technological neutrality;
- enhance sustainability and scalability;
- ensure transparency in all aspects of government funding programs;
- maximize the role and risk taking of the private sector;
- leverage the financial capability of the private sector;
- minimize deployment costs;
- encourage public and private sector partnerships;
- respond to community needs; and
- build community capacity.

The results of this evaluation reduced the scope of possible models for consideration to two. These can be summarized as follows.

### Infrastructure Support Model

The infrastructure support model focuses on incentives that stimulate the supply of broadband infrastructure and services. Under this model, governments would provide funding to network builders for identified communities for the creation of broadband facilities of two sorts:

- transport networks that would link national networks to communities; and
- access networks that would link individual homes and businesses within communities to the community point of presence for the transport network.

### Community Aggregator Model

The community aggregator model focuses on the stimulation of demand. Under this model, governments would invest in user-based demand aggregators to stimulate the delivery of broadband capability. Such a program could address issues of transport to and access within communities together or separately, and could have two components:

- a community champion component that would provide assistance to community champions who would seek out interests for broadband services within the community, create partnerships, identify matching funding and make the overall business case for the delivery of broadband capability to, and within, the community; and
- an aggregator funding component that would provide financial support to aggregators of local demand for funding for the deployment of transport and access facilities.

Detailed descriptions of these two models are presented in Appendix G to this report.

In these models, open access to the facilities, including the point of presence or meet-me point, is a critical element. The models propose that the creation of such open access PoPs be an element of transport network construction. However, it is recognized that situations calling for the deployment of access facilities may arise where adequate transport facilities already exist but where the creation of an open access PoP is required. In other situations, adequate access facilities may exist, while transport facilities are inadequate. In such cases, it is suggested that the creation or modification of PoPs and of access to existing facilities be addressed by the program administrator. For example, in the situation where transport facilities already exist but local broadband service is not offered or available, requests for funding through an access initiative could include support for real costs associated with connection to existing transport facilities. This could include upgrades to PoPs or funds to offset the cost of using these existing transport facilities to address the underlying objectives of the program.

More generally, when considering the detailed descriptions of these models in Appendix G, governments and other stakeholders should appreciate the spirit in which they have been developed and presented. These models are not intended as mutually exclusive nor as prescriptions of the only ways in which government might stimulate deployment of broadband services in areas of Canada unlikely to be served by the market. They are not necessarily intended to be used by governments as operational manuals through which to allocate public support for broadband deployment initiatives.

Rather, the primary purpose of these models is to illustrate best practices which, other things being equal, could be followed by governments and other stakeholders when broadband deployment initiatives are being designed and implemented.

It should be noted that the recommended models address the mandate of the Task Force and the objectives we have noted in very different ways. For example:

- In the infrastructure support model, the scale and scope of public and private partnerships would probably be considerably greater than in the community aggregator model, since they would likely cover a larger territory.

- For similar reasons of scope and scale, the process used in the community aggregator model to identify community needs, build community capacity and maximize the role and risk taking of the private sector would differ considerably from the process used in the infrastructure support model.

Although it is possible to find relatively pure examples of the two recommended models, the Task Force expects that most government initiatives to deploy broadband services to areas unlikely to be served by the market will combine features of both, and that hybrid approaches may well provide the best long-run solutions to meeting the differing needs of different parts of the country. For example:

- In some areas, the infrastructure support model, or a variation thereof, may provide the best approach to deploying broadband to communities, while the community aggregator model, or a variation thereof, may provide the best approach to providing access within communities. This is perhaps particularly likely to be the case in the currently underserved, but relatively densely populated, areas of the country where there is already effective competition between competing transport and access providers and an established tradition of community-based action.
- In other areas of Canada, lower population densities, higher serving costs and limited competition between different transport and access technologies might argue in favour of something approaching the infrastructure support model for both transport and access, modified to incorporate a higher degree of community involvement than in the pure form of the infrastructure support model.
- In still other areas of Canada, very low population densities and very high serving costs combined with no real prospects for competition between different transport and access technologies might argue in favour of something approaching the community aggregator model for both transport and access, modified to incorporate a wider geographic and demographic scope and a closer relationship with the transport supplier than in the pure form of the community aggregator model.

Bearing these various points in mind, and recognizing that the details of any particular government program or initiative will depend in part on the circumstances of the community, or of the province, we recommend that:

***Recommendation 2.1: Governments should accelerate broadband deployment in those communities where without government involvement the private sector is unlikely to deliver such service, through the use of the supply-oriented infrastructure support model and the demand-oriented community aggregator model, as described above, or variations thereof, either independently or as complements of the other.***

Bringing together user demand for broadband services at the community level is an effective means of creating a viable and sustainable business case for broadband deployment. Government demand for telecommunications services often plays a critical role in creating such a business case, particularly in smaller communities. Recognizing the importance of government procurement, it is further recommended that:

***Recommendation 2.2: Governments should examine their procurement policies to ensure that these policies encourage the participation by their local offices and agencies in local demand aggregation initiatives, and take any appropriate steps to encourage and enable such participation.***

## 4.5 Estimates of Investment Requirements

To estimate the levels of investment required to implement this action plan, the Task Force developed investment models by combining data on unserved communities provided by telecommunications and cable companies with data from Statistics Canada on the characteristics of these communities, including their level of metropolitan influence.

To establish a baseline for this exercise, unserved communities were defined as communities without access to DSL or cable Internet services as of December 2000. However, an assumption was made that the private sector would serve some communities that are currently unserved without the need for government funding by 2004. In addition, communities were considered served – whatever their current status – if a provincial government had already announced that it would fund service to that community (e.g. through SUPERNET in Alberta or CommunityNet in Saskatchewan).

Estimating the investments required to undertake an exercise of this scope and nature involved a number of assumptions, such as the nature and mix of technologies and the extent of the take-up of service by institutions, businesses and individuals. The resulting estimates can only provide an indication of the order of magnitude or range of investments that would be required to meet broadband deployment objectives.

It is also important to note that the proportions to be funded by governments on the one hand, and the private sector on the other, will vary considerably depending on the density and remoteness of the community, and on whether the investment in question is targeted to transport, connecting public institutions or connecting businesses and residences.

### Associated Recommendation

***The Task Force submits the following estimates to the federal government to indicate the order of magnitude or range of total investments that would be required to meet broadband deployment objectives by 2004, in partnership with other stakeholders.***

- ***Transport to unserved communities: Estimates of total required investment range from $1.3 billion at the lower end to $1.9 billion at the upper end. The latter would involve a higher proportion of fibre as compared to wireless and satellite technologies.***
- ***Connecting public institutions: Estimates are in the $500 to $600 million range, again depending on the mix of technologies.***
- ***Connecting businesses and residences: Estimates of total required investment vary considerably, not only by reason of the nature and mix of wireline, wireless and satellite technologies assumed, but also as a function of take-up rates on the part of customers. As a result, numbers developed for the Task Force, based on DSL/cable modem wireline technologies, as well as wireless and satellite, range from $900 million at the lower end to approximately $2 billion at the upper end.***
- ***Funding for community champions: On the basis of previous experience with public access programs, we estimated that approximately $50 to $70 million would be required.***

In presenting these estimates, the Task Force wishes to emphasize that actual investment requirements can only be determined on the basis of competitive bids for specific deployment projects, and that the private sector share of these investments will be determined through competitive processes designed to capitalize on that sector's willingness to invest.

***This report is about the deployment of broadband technology in areas of Canada that the market is unlikely to serve by 2004. It is also about Canadians everywhere, and what must be done to ensure that they are able to use this technology to enhance the quality of their lives.***

As well as recommending strategies and actions that would ensure that all Canadians have access to high-speed broadband by 2004, the Task Force was asked to provide general advice on how the government can meet its objective of ensuring that Canada is a world leader in the broadband revolution.

Although providing all Canadians with access to broadband networks and services is an essential first step toward meeting this objective, it is the tip of the iceberg. The underlying challenge is to foster the use of broadband by Canadians to innovate in economic, social, cultural and political life, and in the governance of our society at every level from the community to the national.

The opportunities and benefits of the broadband revolution – and its challenges and costs – do not lie primarily in network deployment. Instead, they lie in ensuring that all Canadians have equitable opportunities to learn to use the power of broadband communications to transform the way they work and live, and to develop innovative products and services.

From a content perspective, broadband communications have the potential to foster a deeper understanding of Canada and its rich diversity and to nurture a culture of learning, innovation and creativity – a learning society.

Meeting these broader objectives will require the federal government to address the following issues, in collaboration with other stakeholders as appropriate.

## 5.1 Addressing the Digital Divide

### Equitable and Affordable Access

As with other key QOL indicators, access to the Internet correlates with income as well as with geographic and demographic factors, so that there is a digital divide between richer and poorer Canadians. There is no reason to expect the situation to be different with broadband, given the costs (monthly subscription plus computer plus hardware). Under current policy and law, all Canadians are supposed to have access to education and health care regardless of income, and are entitled to support in seeking jobs for which they are qualified. As broadband becomes an increasingly important component of work, learning and health care, what is the best way to ensure that, regardless of income, all Canadians have access to services and opportunities available to the majority of Canadians?

There is a distinction between "equitable" and "equal" or "identical." In some respects, equity is consistent with a lower level of service, for example, through subsidizing service and equipment in public access institutions, rather than in private residences. In other respects, equity entails higher levels of service, if rural communities are more dependent on broadband access. The challenge is to determine what is "fair" in each of the following situations, bearing in mind past precedents and the features of broadband that may require innovative approaches.

***Recommendation 3: Government should take leadership to ensure that affordable access to broadband services is available to all Canadians by 2004, through support for:***

- ***public access sites;***
- ***individuals with low income;***
- ***individuals with disabilities and who have other kinds of special needs; and***
- ***First Nation and Inuit communities, as a matter of priority.***

## Capacity Building for Public Access Sites

*Public access*

Why, when home and workplace access are becoming more mainstream in Canadian society, will public access sites continue to be essential for the foreseeable future?

- The current experience of public access sites, especially in public libraries, indicates that the demand is actually growing and not declining.
- Studies of the digital divide conclusively establish that many citizens, due to economic circumstances, cannot and will never be able to afford broadband access in the home. Children in households with low income are more than three times as unlikely to have any form of computing available at home. Even in households with computers, many have only older computers that cannot take advantage of broadband applications.
- School access, even in designated public access sites, is not generally available during evening or weekend hours. Families with several children dependent on one home computer use public access sites to complete school assignments.
- Many Canadians use public access because they lack technical proficiency or confidence and require assistance for searches and transactions they view as quite complex. This is increasingly true of government applications such as e-filing of tax returns.
- Public access remains a key to market development for commercial Internet access. Public access tends to stimulate private access among citizens with the financial means to obtain computers and Internet accounts. Having tried out the product at public access sites, they experience a growing relevance to their interests and needs.

## Requirements of Effective Public Access Sites

Public access sites are inclusive and welcoming community access points to on-line information and transactions. Users may access high-speed public facilities for a wide range of purposes, from e-mail exchange to the use of multimedia, interactive information. Among many possible uses are participation in on-line courses, searching employment information, filing income taxes, conducting health tests and participating in simulations or experiments related to educational projects.

While many of these services are essential for citizens without home access, many people with even broadband access will continue to use public sites both for personal assistance and for access to highly specialized proprietary information that they may not afford to subscribe to continuously in the home. This is analogous to the use of traditional reference library resources. An effective public access site ensures that users can obtain the maximum benefits of on-line access, through:

- high-quality workstations;
- high-speed connectivity to ensure users are able to use interactive applications and services;
- access to specialized or high-demand proprietary content (e.g. reference databases);
- availability of support personnel with expertise in using interactive, on-line content and services;
- access to ancillary services such as printing, scanning, etc., often offered on a cost-recovery basis;
- adaptive technologies to ensure facilities are accessible for people with disabilities; and
- convenience of hours and location as well as a reasonable ratio of terminals to citizens.

## Gaps in Existing Public Access Services

*Distribution of public access sites*

The major current public access program operating in Canada, the Community Access Program, was designed on an initial estimate of one site per 3000 people, or 10 000 sites for a population of about 30 million. Currently, 9200 sites are planned or in operation. The experience of demand, especially in public libraries,

indicates an urgent need for improvement in these ratios. Given the growing range of on-line services offered by public access sites, and the additional demand that broadband applications have been generating where available, an average of one public access workstation for every 500 residents is needed across all types of sites. At an average of four workstations per site, this would require about 6000 additional public access sites.

*Incremental expenses for high-speed connectivity*

In cases where high-speed access would result in connectivity costs far exceeding the limited margins on which public access sites operate, it will be necessary to ensure that any funding program for public access sites includes funding for high-speed access.

*Licence fees for content*

One area of growing magnitude is licensed proprietary content, as the Internet increasingly becomes a "toll road." (For example, the *Encyclopaedia Britannica* recently reversed its decision to make the resource available without fees.) It is necessary for public access sites to provide at least a minimum of proprietary content to meet basic information needs of users.

*Staff training*

The range of applications, in both government and non-government applications is growing, and public access sites must assist citizens to use and benefit from these applications. Training on a train-the-trainer basis is the key to ensuring the minimum level of skill required to assist users to function with reasonable independence and privacy.

***Recommendation 4: To ensure that public access sites have the capacity to provide access to a wide clientele, governments should:***

- ***ensure the availability, accessibility, affordability and sustainability of access to the Internet and required equipment;***
- ***ensure technical and user support to enable public access sites to maximize their capacity to use and provide broadband services; and***
- ***ensure training and continuous professional development for public access providers.***

## 5.2 Raising Awareness and Encouraging Use

***Recommendation 5: Governments should work with stakeholders and the private sector to raise the level of awareness of the benefits of high-speed connectivity, and increase usage by individuals, communities, businesses and all levels of government, through:***

### Research and Pilots

Long experience has shown that it is one thing to deploy a new technology that promises to change the way things are done, and quite another thing to redesign structures and processes to take advantage of the transformative potential of the new technology. The history of office-automation technologies and the Internet are only the most recent illustrations of this fact of life. To accelerate the process of adaptation, it would be very useful to undertake research in real-life situations, such as pilot projects, and to share the lessons learned among all stakeholders in an organized and structured fashion.

***Recommendation 5.1: Support for research and pilot projects that further the knowledge of the social and economic benefits of broadband, particularly in the areas of learning and skills development, health and health care, government and governance, culture and entertainment, community access and nation building, and e-commerce.***

## Individuals

Ultimately, it is individuals who will make the difference in determining whether Canada takes full advantage of the broadband revolution. To take action, they must first be aware of the opportunities and challenges it presents. This is particularly important for people living in rural and remote areas who stand to profit most from broadband access, but may currently have the least information about it.

While SMEs and communities appear to have a basic awareness of the potential of broadband, the general population is not aware of the benefits and the challenges that broadband will bring into their life. Broadband applications (e.g. tele-work and e-learning) will change the way Canadians work, learn, entertain themselves and involve themselves in the governance of Canada. They need to be aware of what broadband can do for them if they are to capitalize on these new technologies to improve their standard of living and their quality of life. If Canadians are to use broadband technologies to their full potential, they need to become more confident in using them.

Accordingly, we recommend:

***Recommendation 5.2: Support for information campaigns and promotion of best practices targeted toward individual citizens.***

## Empowering Communities

The Task Force believes that activities at the community level are critical to ensuring that local businesses and service organizations learn both how best to take advantage of broadband connectivity in their own operations and become engaged collectively in the process of transforming their local environment into a "smart community." Some have argued that such a transformation offers the best chance for many smaller communities to remain, or become, economically sustainable by attracting investment and new businesses, developing a skilled work force (including retaining their young people) and preserving and transmitting their culture.

For all communities, there will be value in learning more about what other communities in similar situations are doing. This is particularly the case for communities that are struggling with broadband implementation because of lack of relevant knowledge. They could benefit from information and workshops on the adoption and implementation of e-solutions (e.g. tele-health, tele-work, e-learning, e-business).

Experience has also shown that implementation projects succeed only when there is a champion to push the cause and professional executive staff resources to conduct the project. Community, SME and other organizational leaders are critical to steering the adoption of broadband applications and solutions. They are the ones who must understand the importance of these technologies and pilot their organizations through the necessary transformation. We recognize, however, that not all communities will be equally well off in this regard and that the leaders within a community may need expert advice and professional support to be effective in designing, negotiating and implementing appropriate broadband solutions.

Accordingly, we recommend:

***Recommendation 5.3: Support to communities, including local and voluntary organizations, local government operations, businesses and citizens working together to:***

- ***help them define strategies to take advantage of broadband services in achieving their economic development objectives and to assist with the implementation of critical community applications;***
- ***develop tools to help decision makers in both the community and businesses to make more informed decisions about the application of technology;***

- ***prepare guidelines, best practices and case studies that will help all communities become "smart"; and***
- ***develop applications.***

We note in passing that economic development strategies are necessarily locally constrained and are dependent on geographical location and local history, as well as on local strengths and weaknesses that can be, respectively, leveraged or overcome through appropriate activities or strategies. In some instances, there will be sufficient activity at the local level in a particular area that a regional concentration of strength might be said to exist. In others, proximity to nearby major centres might offer special opportunities. In the latter cases, there might be opportunities for urban and rural planning departments to collaborate to take advantage of broadband networks as a means of relieving urban stress in areas such as transportation by encouraging businesses to locate in adjoining regions while remaining a part of the major centre's overall cluster of activity.

## Encouraging Business Use, Particularly by SMEs

Whereas general awareness of the potential of the Internet in general and e-business in particular to help both the self-employed and businesses has probably been achieved, we are not convinced that the level of awareness, especially in smaller communities, has yet reached the point that businesses, especially SMEs, know how to redefine their business models to take advantage of e-business opportunities. The Canadian E-Business Roundtable has noted many SMEs have overcome the awareness barrier, but they are now confronting the more difficult task of implementation. Indeed, many SMEs are struggling with this challenge either because of lack of knowledge of how to go about the task, or because they feel the value proposition has not been clearly established.

The arrival of broadband infrastructure within all communities will make overcoming this impediment a matter of urgency. The applications involved are likely to be both business-to-business and business-to-consumer. The former are critical to ensuring the viability of local businesses, especially those involved in providing products and services to remote corporate customers through on-line supply chains or e-markets. The latter are important to meeting the needs of local customers, and therefore to building the demand for broadband access.

Accordingly, we recommend:

***Recommendation 5.4: Support and training for businesses to:***

- ***help accelerate adoption of e-business solutions, particularly among SMEs; and***
- ***make them more aware of the critical importance and urgency of implementing broadband technology in their organizations.***

## Governments as Model Users

Action by the federal and provincial governments to meet the GOL goal of making all government services available on-line, interactively in real time by 2004, could have an enormous impact at many levels in making Canada a world leader in broadband connectivity. In particular, the total migration of government services to an on-line broadband environment would raise awareness; stimulate the development of broadband services, applications and content by Canadian industry; provide a guaranteed source of revenue – especially to public access sites – which would help firm up partnerships for the deployment of broadband access to areas of the country unlikely to be served by the market; and save a lot of money that could be reallocated according to the wishes of the Canadian people.

Accordingly, we recommend:

***Recommendation 5.5: Governments, including public learning, health and cultural institutions, should act as model users and establish and monitor specific goals for model use of broadband content and services and should provide:***

- ***leadership in government services on-line, the popularization of e-governance (e.g. on-line town halls, consultations, participation in the electoral process) and the aggregation of demand through collaboration between government departments at all levels; and***
- ***extra support to public institutions in the areas of equipment, technical support and training, where necessary in order that the benefits associated with access to broadband content and services be effectively realized.***

### Support for Development of Necessary Skills

To succeed in the networked economy, Canada needs a creative, innovative workforce. Accomplishing this will be a matter of better training in appropriate skills at all levels of the educational system, up to and including post-graduate study in key scientific and technical disciplines, better retention in the country of those who are already trained and better attraction of trained people from outside the country through such measures as special programs to attract international students into our universities, more visas for temporary workers in key areas and easier transition from temporary and student visas to landed immigrant status. Each of these areas is complex, and there are no easy or simple solutions. Nonetheless, there is probably no issue of greater importance for the country.

Accordingly, we recommend:

***Recommendation 6: Governments should work collaboratively to:***

- ***create the conditions necessary for the development, retention and attraction of a Canadian workforce with the necessary education and skills to ensure Canada's competitiveness in the networked economy, now and in the future; and***
- ***help users develop skills required to participate in the networked economy. This includes both learning and health service providers, as well as end users.***

## 5.3 Innovation in Content and Applications

### Innovation in Content Development

In the borderless, broadband world of the future, the challenge will once again be – as it has been in the case of every communications revolution in the past – to foster the development of services, applications and content that meet Canadians' specific needs and reflect their unique experience and point of view.

Accordingly, we recommend:

***Recommendation 7: Governments should encourage the development of innovative content and services, particularly for learning, health, government, culture, entertainment, community building and e-business. Development of this content should be supported through incentives and direct funding as appropriate, through expanding the mandate of existing programs to incorporate funding for broadband content or by creating new programs.***

***On-line content and services should:***

- ***reflect the social, economic and cultural perspectives of Canadians;***
- ***respond to significant special needs of users;***
- ***be user-centred and user-friendly; and***
- ***be available in both official languages and in a format relevant to Aboriginal peoples.***

### Innovation in Applications and Technology Development

***Recommendation 8: Innovation in applications, and the underlying technologies, are key to maintaining the strong ICT sector required to make Canada a leader in the supply and export of broadband technologies. This can be accomplished both through support for private sector innovation and through national research and education networks.***

The main value that broadband will add to Canada's economy is not through the deployment of technology, but through the development of broadband services, applications and content that reduce the cost of both doing business and delivering public services, and create new sources of revenue from consumers in Canada and other countries.

The growth of Canada's ICT sector, as in other countries, continues to exceed the rest of the economy by a wide margin. This sector is already a major contributor to our prosperity, and will become an even more significant contributor in the future.

However, every country in the world recognizes the important economic role that its domestic ICT industry can play, both in supporting innovation in other sectors and as a sector in its own right, and is actively developing strategies to exploit whatever advantages it has in an increasingly competitive world. The success of our transition from a resource-based economy to a 21st century, knowledge-based economy could well hinge on how effective we are at developing our own strategy.

If Canadian ICT firms are to take advantage of the development of a world-leading broadband infrastructure within the country, they must first become engaged in providing technologies and services using that infrastructure, and then in leveraging that experience in global competition with others. Needless to say, success in either of these activities requires a domestic Canadian industry that is innovative, collaborative and competitive. As the Conference Board of Canada put it in a 1998 report, "Innovation is recognized as the major, if not the sole, sustainable source of economic growth and the major determinant of the wealth of a nation."

To help encourage Canadian ICT businesses to exploit the opportunities created by the rapid deployment of widespread broadband access, we recommend:

***Recommendation 8.1. The federal government should establish a broadband applications development program aimed at encouraging Canadian ICT firms to develop innovative applications for broadband networks, focusing particularly in the areas of e-learning, e-health and e-business. Care should be taken to ensure that such programs encourage SME participation.***

Broadband networks and services are rapidly evolving – pushed by technological advancements, pulled by market demand – and the broadband area is one in which Canada has great technological strength. It is vital to the future health of Canada's ICT sector that we maintain our global position in these areas, in the face of increasingly strong global competition. Beyond this, it is vital to the success of our strategy to make Canada a world leader in broadband connectivity that we have an industrial base capable of supporting – and learning from – our efforts to support and encourage broadband deployment and use. As in every high tech sector, world class research and development (R&D) is a necessary (although not sufficient) condition for maintaining a competitive edge.

Accordingly, we recommend:

***Recommendation 8.2: The federal government should identify ways in which current technology development programs, as well as the work of federal labs and federally supported research activities can be enhanced and focused so as to contribute more effectively to developing the innovative potential and competitiveness of Canada's ICT sector. Priority should be placed on the areas of broadband technologies and applications, as well as on the basic sciences underlying both, such as micro-electronics, photonics and wireless.***

## 5.4 Government Leadership

### Creating an Enabling Policy and Regulatory Environment

The broadband revolution has brought into sharper focus public policy and regulatory issues in a number of domains that have already been raised by narrowband Internet. The main policy domains likely to be affected are:

- telecommunications, broadcasting, media and cultural policies;
- copyright and intellectual property rights (respect for property balanced with consideration for public access);
- competition (market power, vertical and horizontal integration between network layers and different media); and
- consumer protection (privacy, security, fraud, misrepresentation, offensive, harmful or illegal content).

Accordingly, we recommend:

***Recommendation 9: Government should ensure that framework policies, which safeguard a fair and efficient marketplace for both producers and consumers, adequately reflect changes in the economy and the broadband environment. Further, the policy and regulatory environment governing the telecommunications sector should recognize the pace of technological change and create conditions which promote competition, innovation and the deployment of high-speed networks.***

## Information Policy

Among the applications most likely to provide economic benefits, especially at the level of the local community, are e-business and tele-work. Many commentaries have mentioned that e-business, in particular B2C e-business, will only develop to its fullest if potential users have confidence in it. While there is no single way to accomplish this, and the applications themselves have to provide value if individuals are going to use them, it does appear that perceived lack of consumer protection in areas such as privacy and security, among others, is acting as an impediment to take-up of these applications.

The need to protect the public from illegal and offensive content, in a manner that is consistent with the *Canadian Charter of Rights and Freedoms*, will become even more significant in a broadband environment. The Task Force welcomed the launch in February 2001 of the federal government's Canadian Strategy to Promote Safe, Wise and Responsible Internet Use on this front, including the work of such partner organizations as the Media Awareness Network, the Canadian Association of Internet Providers, the Canadian Library Association and the Canadian Cable Television Association. This strategy includes initiatives that educate and empower users, effective self-regulation, law enforcement, international collaboration and a commitment to establish an Internet hotline for Canada. It is understood that public education and awareness is a shared responsibility among Internet service providers, Internet users, parents, independent organizations, governments, Web-site producers, schools, libraries and the police. Vigilance and collaboration on the part of all these parties will be required to ensure safe, wise and responsible Internet use, and to protect the well-being of our young people.

There is a need to ensure Canada's copyright laws, which provide a carefully crafted balance between two competing public policy objectives, keep pace with the digital age. These public policy objectives maintain appropriate incentives for creators of content, while allowing appropriate exceptions and limitations that permit reasonable use of digitally formatted works, for the benefit of society as a whole. This balance protects the creators of works, strengthens the market for new content and ensures reasonable conditions for research, education and private study. As broadband applications become available to learners of all ages at home, at school and at work, the educational opportunities envisaged by the Task Force, within a responsive policy framework, will benefit Canadians in all parts of the country.

***Recommendation 9.1: Governments should continually review regulations and practices in the areas of privacy, security, consumer protection, protection against illegal and offensive content, copyright and the legal framework for electronic transactions in cases where it is clear that market forces are not providing adequate direction.***

## Foreign Investment Restrictions

Current legislation restricts the amount of foreign capital to which domestic telecommunications service providers and cable companies can get access. These restrictions limit the amount of foreign voting capital to 20 percent in operating telecommunications carriers and broadcasting distribution undertakings, and to 33.3 percent in holding companies. They also require that both be Canadian controlled.

Expanding the availability of broadband services to all Canadians will require huge amounts of capital investment. The focus of this Task Force's recommendations is on rural and remote areas where market forces alone are unlikely to achieve the government's objective by 2004. However, it should also be recognized that the investments required to achieve deployment of competitive broadband services in all urban areas across Canada are not insignificant. Achieving the government's objective will require that the industry as a whole be efficient, competitive and well financed so that it can expand service availability on its own in more densely populated areas and be in a position to partner with government to achieve broadband objectives in more rural and remote areas. Many in the industry have expressed a willingness to invest in improved broadband services, both alone and in partnership with the government, but are concerned that they might not be in a position financially to do so. Others have maintained that these restrictions have the effect of increasing the cost of capital that is raised.

***Recommendation 9.2: To ensure that a maximum amount of capital is made available to finance the expansion of broadband access and to ensure that all industry participants are in a position to partner with government in facilitating broadband deployment, the federal government should conduct an urgent review of foreign investment restrictions for telecommunication common carriers and distribution undertakings with a view to determining whether they are currently restricting or are likely to restrict increased industry participation in the competitive deployment of broadband infrastructure in Canada.***

***This review is only intended to include restrictions on foreign investment in telecommunication common carriers and distribution undertakings.***

## Capital Recovery

In consideration of the issues noted above with respect to the requirement for an efficient, competitive and well-financed industry, and recognizing that much activity in the telecommunications industry is governed by competitive market forces, there is still a significant portion of capital recovery that is affected by CRTC decisions. These decisions, in matters such as service lives, depreciation rates or pricing mechanisms, while seeking an appropriate balance of interests, can have intended or unintended consequences that may impede the ability of various industry participants, regulated or unregulated, to recover, generate or support capital.

***Recommendation 9.3: The Canadian Radio-television and Telecommunications Commission should ensure that its decisions, in matters which affect revenues, reflect the particularly heavy demands and challenges facing facilities providers in terms of capital generation and capital recovery.***

## Rights of Way

Whether crossing a city street or running along a highway, carriers require access to public rights of way to deploy the telecommunications facilities that carry basic telephone service, cable television and advanced broadband services to businesses and individual Canadians. Historically, governments dealt with monopoly carriers to make arrangements for access to public properties for which they were responsible. In a competitive telecommunications market, demand for access to rights of way has increased, and arrangements have therefore become more complex, presenting new challenges. Nevertheless, the benefits of a competitive, advanced telecommunications infrastructure for economic growth at all levels of society and size of community are significant. Clearly, the manner in which rights-of-way issues are dealt with can either facilitate or inhibit deployment of telecommunications infrastructure.

***Recommendation 9.4: All levels of government should examine rights-of-way issues to ensure that they do not serve as a barrier to broadband deployment.***

### Access to Content and Service Providers

The social and economic benefits of broadband connectivity arise primarily from the instant access that it provides to a wide range of content and service providers, eliminating the barriers of distance and the high costs that have long been associated with bridging the many gaps that distance creates. Elsewhere in this report, we have discussed the many potential benefits arising from e-business, e-learning, e-health and e-content. In our view, broadband networks are most likely to deliver these benefits in an environment where all communities, institutions, businesses and individuals in Canada have access to the widest possible range of content and service providers. Competitive markets are generally the best means to foster end-user choice. The Internet's open standards and open access also enable end-user choice. As well, current telecommunications and broadcasting policies that ensure third-party access to network facilities through regulatory intervention, where required, also contribute to end-user choice.

***Recommendation 9.5: Government policy and regulation should foster the widest possible access to content and service providers, with a view to enabling consumer choice.***

### Branding Canada

In spite of Canada's great technological achievements, capabilities and potential, survey research has shown that we are not always perceived as world-leading innovators, even by our closest trading partners, and particularly by investors.

If Canada is perceived to be a leader in broadband applications, it will attract investments and resources, and generate the entrepreneurial activity needed to increase its performance in the new economy. This increased performance will then further enhance perceptions, creating a virtuous circle of success.

The reverse could also happen. There may be a gap between perception of Canada and its real performance. This perception-performance gap is particularly important in the new technologies business environment where investments and talent are relatively mobile and where other countries are already competing for these valuable resources.

To help develop improved awareness of Canadian companies internationally, we recommend:

***Recommendation 10: The federal government should leverage Canada's broadband technology and applications strengths and success stories to build Canada's reputation as a global leader.***

## 5.5 Investment in Innovation and Use

The Task Force recognized that investment in innovation and use of broadband networks, including innovative services, applications, technologies and content, as well as public access and individual and community capability development, is absolutely essential to capturing the economic and social benefits associated with broadband.

We did not develop specific investment models relating to our substantive recommendations in these areas, in part because the programs and initiatives through which they would be implemented are distributed across all levels of government and the private sector. Significant total investments in these areas must be made by all of these stakeholders if the goals that we have defined are to be met.

### Associated Recommendation

***The Task Force recommends that the federal government provide leadership in the collective effort to respond to opportunities and needs arising from the deployment of broadband networks and services, including those also addressed by other task forces, advisory committees and roundtables, by making substantial and increasing budgetary investments through new and existing programs.***

# Conclusion

The National Broadband Task Force held five meetings in all. The first took place on January 11, 2001 and the last took place four months later, on May 9-10, 2001. As the scope of our report and recommendations indicate, it was no small matter to discharge our mandate in such a brief period of time.

We began our work with a sense that we had an opportunity to say something important to Canadians, not only about the need to extend access to broadband networks and services to all Canadians, but also about the future of our country. The discussions, dialogue and debate that took place during and between our meetings confirmed that this was so.

Our main order of business was to identify communities that are unlikely to obtain broadband access as a result of market forces alone by 2004, and to recommend strategies involving collaborative action among all stakeholders to ensure that businesses and residents in these communities have an opportunity to participate in, and benefit from, the broadband revolution.

To carry out this task, we found that we had to cast our net more widely and begin our work by developing a shared vision and a common understanding of what broadband is and why it is important for all Canadians, particularly for those living in First Nation, Inuit, rural and remote communities.

These reflections led us to develop a set of guiding principles, which we used to shape our report and as a touchstone to develop and test our recommendations. Beyond serving these immediate purposes, we hope that the Task Force's principles provide a general framework that will assist the federal government in addressing the issues identified in our report in the coming years.

Our initial reflections also led us to wrestle at some length with the definition of broadband. Although communications engineers have developed precise definitions of broadband in terms of information transmission rates, we found considerable variations in common usage of the term, in Canada and the other countries we studied.

In the end, we thought it was most important to define broadband in terms of what it can do for Canadians – in particular, to improve innovation, economic productivity and competitiveness, the delivery of learning, health care and other public services, and cultural expression.

From this point of view it became clear that, to capitalize on the opportunities presented by the broadband revolution, we need to do more than develop and deploy technology. We also need to create applications and content that will enable Canadians to use the potential of broadband to enhance our performance in these and other areas of national life. In addition, we need to create an environment that will encourage private investment in the development of broadband networks, services and content, while protecting the rights and interests of consumers and content creators.

This being said, the deployment of broadband networks and services to and within all Canadian communities is a significant nation-building challenge, comparable in the view of the Task Force to similar tasks we have undertaken in the past.

After much analysis, discussion and deliberation, we have recommended a practical, but nonetheless ambitious, strategy for meeting the federal government's goal of ensuring that access to broadband – as we have defined it – is available to businesses and residents in every Canadian community by 2004.

As well, we have recommended a comprehensive set of actions aimed at ensuring that all Canadians, in urban as well as First Nation, Inuit, rural and remote communities, will have opportunities to benefit from the broadband revolution, through access to innovative broadband technologies, services, applications and content designed to meet Canadian needs.

In addition to recommending that governments keep a watching brief in a number of policy areas affected by broadband, we have recommended that the federal government review existing policies and regulations in a number of specifically targeted areas, with a view to ensuring that these policies and regulations enable and encourage private investment in the development of broadband networks and services.

Although our recommendations are ambitious and comprehensive, we are convinced that they are practical and attainable by 2004. In our view, the implementation of these recommendations will benefit all Canadians and add to our long-established reputation as global leaders in the field of telecommunications technology and applications.

As we have indicated throughout our report, however, these goals can only be achieved through partnership between and collaboration among all stakeholders – the federal government, governments of provinces, territories and municipalities, the private sector, providers of education, health care and other public services, and communities themselves.

Co-ordinating the contributions of all these stakeholders and focusing them on the task at hand will not be easy – but it must be done to bring the benefits of broadband to all Canadians. In concluding our report, we therefore wish to present a final, overall recommendation to the Government of Canada.

## Overall Associated Recommendation

***As the federal government prepares to respond to the Task Force report, it should seek views from partners at all levels on how recommendations should be implemented.***

# Appendix A – Task Force Members and Contributors

**Chair**

*David Johnston,* President, University of Waterloo

**Members**

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Canadian Association of Broadcasters

Canadian Association of Internet Providers

Canadian Cable and Television Association

Canadian School Board Association

Canadian Wireless Telecommunications Association

CATA Alliance

Federation of Canadian Municipalities

Information Technology Association of Canada

Recognition should also be given to the many staff members and associates of Task Force members who contributed significantly to the working groups.

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# Appendix C – Public Submissions

These submissions, from organizations or individuals, were received either through the National Broadband Task Force Web site, e-mails to the Secretariat or letters to the Task Force or the Minister of Industry. Electronic submissions are posted on-line at **http://broadband.gc.ca**

1. Advisory Committee for Online Learning.
2. Agriculture and Agri-Food Canada, Rural Secretariat. "Background Report to the National Broadband Task Force: Rural and Remote Broadband Access," April 12, 2001.

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3. Anil Anthony, Scarborough, Ontario.
4. Julie K. Arie, Alberta.
5. G.W. Bradbury, President, Bradbury Technologies, Ridgeway, Ontario.
6. Canada's Coalition for Public Information (Andrew Clement, Board Member), Winnipeg, Manitoba.
7. Canadian Cable System Alliance.
8. Canadian E-Business Opportunities Roundtable, John D. Wetmore, Captain of e-Business Acceleration Team and Vice-President, ibm.com, Americas.
9. Richard Civille, Michael Gurstein, PhD and Kenneth Pigg, PhD, "Access to What? First Mile Issues for Rural Broadband."
10. Sam Coghlan, "Community Networks: the Oxford County Perspective," Oxford County Library, November 30, 2000.
11. Community-One Lan Solutions, "A position paper on DSL," Midland, Ontario.
12. Contact North, Maxim Jean-Louis, President and CEO, Sudbury, Ontario.
13. The Copyright Forum, "Submission to the National Broadband Task Force," May 10, 2001.
14. Discovery Regional Development Board, "No Boundaries Wireless Network Project," Clarenville, Newfoundland.
15. Orin Durey, Baker Lake, Nunavut.
16. Stephen Foster, Alberta.
17. Mikeal Fosty, Saskatoon, Saskatchewan.
18. Myles Gaulin, Calgary, Alberta.
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22. GrassRoots Consulting Group, Cathryn Wellner and Richard Wright, Williams Lake, British Columbia.
23. Michael Gurstein, PhD, British Columbia.
24. Glen Harvey, Nanticoke, Ontario.
25. Indian and Northern Affairs Canada, presentation by Shirley Serafini, Deputy Minister.
26. Keewaytinook Okimakanak First Nation, "Delivering Broadband Access into the Remote First Nations of Keewaytinook Okimakanak," Sioux Lookout, Ontario.
27. K-Net Services, "From Potential to Practice: Telecommunications & Development in the Nishnawbe-Aski Nation."
28. Justin Kozuch, CEO, WebHeads.
29. David Lekx, Montréal, Quebec.
30. François Ménard, submission of "The COOK Report on Internet" with permission of COOK Network Consultants, U.S.

31. Murray McCabe, CEO/Chief Librarian, King Township Public Library, Ontario.
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33. Marita Moll and Leslie Regan Shade, "What do you want the Internet to be?" February 2001.
34. Miles Muri, Saskatoon, Saskatchewan.
35. Naskapi Nation of Kawawachikamach, Kawawachikamach, Quebec, "Telecommunications Brief."
36. National Telephone Cooperative Association, "NTCA Members Internet/Broadband Survey Report," U.S.
37. Stephen Nelson, CEO, Woodstock Public Library, Woodstock, Ontario.
38. Nordic Economic Development Corporation, Scott Fifield, Flower's Cove, Newfoundland.
39. NorMan Regional Development Corporation, Barbara Bloodworth, President, Thompson, Manitoba.
40. Ryan Norrie.
41. Operation ONLINE Inc., "Enabling Opportunity: Newfoundland and Labrador Stakeholder Report and Submission to the National Broadband Task Force," prepared on behalf of organizers and participants of the Executive Workshop on Communications and Network Infrastructure held in St. John's, Newfoundland, April 9, 2001.
42. David Oxford, Emerald Zone Corporation, Springdale, Newfoundland.
43. Raftview Communications Ltd., Barriere Cable Ltd., Paul Caissie, President, Clearwater, British Columbia.
44. Ricardo Ramirez, "Rural and Remote Communities Harnessing Information and Communication Technology for Community Development."
45. Doctors Don Richardson and Ricardo Ramirez, "PACTS for Rural (and remote) Ontario: Partnerships, Accessibility, Connectivity Transformation Strategies."
46. Terry Rushing, Uranium City, Saskatchewan.
47. Sahtu Dene Secretariat Inc., Sahtu Dene Council, "The SSI/SDC Information Interchange and Communications Network (Introductory Proposal)," January 2001.
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49. Trent Sim, Swift Current, Saskatchewan.
50. SMART Winnipeg, "The Case for Municipal Fibre White Paper."
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52. Daniel Strong, Swift Current, Newfoundland.
53. David Suchanek, Appleby College, Oakville, Ontario.
54. Telecommunities Canada, Gareth Shearman, President, Victoria, British Columbia.
55. Roger Thompson, Port Hope, Ontario.
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58. Upper Canada Networks (UCNet), "Breaking Through Barriers" presentation to Barriers and Models Working Group.
59. Gloria Wiens, Rural Manitoba.
60. Mark Wylie, Principal, Manyberries School, Manyberries, Alberta.

# Appendix D – Background Studies Commissioned for the National Broadband Task Force

These studies are available on the National Broadband Task Force Web site at **http://broadband.gc.ca**

### Infrastructure

1. "Final Report on Inventory of Broadband Internet Services Available in Municipal Jurisdictions," Federation of Canadian Municipalities.
2. "Beyond Connectedness: TSACC Report on Broadband Access (Version 1.0)," Telecommunications Standards Advisory Council of Canada.
3. "Broadband Infrastructure (Services, Networks and Facilities)," Industry Canada.
4. "Gap Analysis of Availability of High Speed Internet Services in Canada," Industry Canada with the Canadian Cable Television Association and a number of major telephone companies.

### Social and Economic Benefits and Challenges

5. "The Next Internet: Broadband Infrastructure and Transformative Applications," CANARIE Inc.
6. "Social Economic Impacts of Broadband in Rural Communities," Community Information Technology Institute (Ken Stratford).
7. "The Availability and Affordability of Internet Infrastructure in Rural Areas of Canada and its Implications for E-Commerce Development," DMA Consulting.
8. "Health-Related Social Benefits and Challenges," Linda Weaver, TecKnowledge Healthcare Systems.

### Barriers and Deployment Models

9. "Legislative and Regulatory Considerations Affecting Broadband Deployment," Industry Canada.
10. "Broadband Access Business Models in Canada," SECOR.
11. "International Public Programs to Provide Broadband Access to the Internet," Jim Savage.

# Appendix E – Glossary of Acronyms

| | |
|---|---|
| ADSL | Asynchronous digital subscriber line |
| B2B | Business-to-business |
| B2C | Business-to-customer |
| BBA | Basic broadband access |
| bps | Bits per second |
| CAP | Community Access Program |
| CO | Central office |
| CRTC | Canadian Radio-television and Telecommunications Commission |
| CSD | Census sub-divisions |
| DSL | Digital subscriber line |
| Gbps | Gigabits per second |
| GOL | Government On-Line |
| HDI | United Nations human development index |
| HDSL | High bit-rate digital subscriber line |
| ICT | Information and communication technology |
| IHAC | Information Highway Advisory Council |
| ISDN | Integrated services digital network |
| ISP | Internet service provider |
| IT | Information technology |
| ITU | International Telecommunications Union |
| Kbps | Kilobits per second |
| Mbps | Megabits per second |
| NTSC | National Television System Committee |
| MIZ | Metropolitan influenced zone |
| OECD | Organization for Economic Co-operation and Development |
| PoP | Point of presence |
| QOL | Quality of life |
| SME | Small and medium-sized enterprises |
| TAP | Telecommunications Access Partnership program (Ontario) |
| VDSL | Very high bit-rate digital subscriber line |
| XDSL | A generic term for the suite of DSL services, where the "x" can be replaced with any of a number of letters, including "A," "H," "M," "RA," "S," and "V." |

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## Infrastructure Support Model

This model is aimed at providing incentives for the delivery of broadband capability to a point of presence in a community and for distribution within the community by investing in a network builder to build the required infrastructure.

This program would be delivered in two components. The first component would provide funding for the deployment of transport facilities to identified communities through a competitive process. In the second component, network builders would be eligible to receive funding through an open process to deploy access infrastructure within identified communities.

### Component 1 – Transport Incentive

This component provides funding to a network builder to build transport facilities to identified communities, selected via a competitive process.

The network builder could be any eligible private or public sector party. It is anticipated that the private sector will have a major role in the deployment of infrastructure to unserved communities. It is equally understood that in certain circumstances, local government ownership or participation may be an option.

All proposals for funding must provide open third-party access to use the facilities from the outset and potential participation in the infrastructure provision. Proposals for the deployment of terrestrial transport facilities must include surplus capacity beyond the immediate and foreseen needs of the applicant. However, it is recognized that satellite delivery proposals will probably only be able to demonstrate minimum service levels.

### Process

This process is driven by the program administrator who defines parameters and establishes eligibility criteria and issues a call for expressions of interest to participate in a competitive process. Those entities that are interested in participating then submit evidence that they meet the eligibility requirements. Eligible parties participate in the competitive process and the successful entities are determined. Afterwards, the successful entities enter into agreements with the program administrator to deploy the transport facilities in the areas where they were the successful bidder.

### Stage 1

The program administrator would make determinations as to the definitions of the respective geographic areas[1] (hereafter referred to as lots), as well as set other basic elements that would be expected of any participant who is successful in the competitive process. This may require public consultation or research to assess accurately and would be finalized by the program stakeholders.

The call would define the following elements. These criteria would be selected to set the bar high, rather than defining the lowest possible solution. These elements include:

- the minimum technical standards for the service, including capacity and scalability requirements;
- service quality standards;
- open third-party access provisions to the facilities, including the requirement for a neutral meet-me point;
- timing, i.e., when facilities are to be implemented;
- the opening bid amounts and bidding details;

[1] *Note that the definition of areas is critical to the success of the process. Areas would need to be large enough to attain the required critical mass required to be sustainable and attractive to prospective providers while small enough to increase the number of potential competitors. Further, a predetermination that areas are unserved by broadband and are expected to remain unserved until 2004 would be required.*

- price ceilings for key components (IRUs, wholesale/retail rates, etc.) and the terms of such ceilings, set at levels to ensure that the incentives would flow through to third parties (wholesale and retail); and
- any other requirements or eligibility criteria.

Applicants would be required to submit evidence that they meet any eligibility criteria and commit to system delivery, if successful. This input would be evaluated and, on review, applicants would be advised of their eligibility to participate.

### Stage 2

Once applicants have been qualified to participate, the competitive process would begin. One of the following two processes could be used to select the entity that would receive the funding and build the infrastructure.

A descending, simultaneous multiple-round auction would be used to select the qualified bidder who will receive the funding for a given lot. Multiple lots would be opened for bidding but, given the complexities of offering too many lots at the same time, the number would be kept relatively small. Participating bidders would reduce their bids (the funding they would require to deploy the facilities) based on their own efficiencies and economies. The last remaining bidder would be the winner of the process for that lot. All lots available for auction would remain open until the bidding ceased on all lots. In this way, bidders could look to combine or aggregate lots based on the dynamics of the interest of others, and react as appropriate during the course of the auction.

- Bids would be on the basis of net present value (NPV) to allow bidders to structure their bids on the basis of a loan using discount rates and terms defined in the call or a grant.

### OR

A sealed bid tender would be provided by participants in the competitive process on a given set of lots. It is recognized that there may be potential interdependencies of lots, and as a result, lots may need to be defined as large regional areas to reduce such interdependencies. Alternatively, lots could be run sequentially so that bidders would know which lots they had won before making bids on other lots.

- Bids would be on the basis of NPV to allow bidders to structure their bids on the basis of a loan using discount rates and terms defined in the call or a grant.

### Stage 3

On completion of stage 2, the program administrator and the winning bidder would enter a funding agreement detailing their obligations and responsibilities. Specifically, winning bidders will have to commit themselves to pricing various transport components at or below the price ceiling defined in the call for a defined period. The winning bidder would need to provide proof that the facilities and services had been implemented according to the agreement before receiving the funding. In addition, the agreement would detail the repayment schedule if applicable.

### Model Evaluation

- This model results in the highest probability that the communities would have the potential of access to broadband services.
- Competitive bids would provide the lowest cost alternative for government.
- It can be a rapidly concluded process for a great number of geographic areas.
- Pre-identifying eligibility criteria, with the only negotiable aspect being the amount of the bid, ensures an open and transparent process, which would reduce the possibility of complaints of unfair treatment or influence.

- It would be very difficult to define minimum speeds, to size and group areas optimally and to know the local situation in-depth to define gaps, even with consultation.
- It is a supply side model that will not provide incentives for usage:
  - does not directly exploit local partnerships; and
  - assumptions for sustainability by bidders may not be realized due to separation of demand from supply.
- The descending simultaneous multiple-round auction:
  - provides an effective and flexible process for selecting winners;
  - permits areas to be kept relatively small to maximize competitive forces;
  - permits related areas to be grouped together dynamically;
  - can be complex; and
  - may require modification of existing tender rules.
- The sealed bid tender:
  - is not a dynamic mechanism and, as a result, requires larger service areas to avoid interdependencies which could result in less competition for the support, or sequential processes for related areas which could take an excessive amount of time; and
  - may be the best solution for areas where bidding competition is expected to be less intense.

## Component 2 – Access Incentive

The fund offers direct incentives to network builders to build broadband facilities within communities. The program would be available for a preset number of years. While the funding is based on an open model, duplicate requests for funding are not expected to occur to any great degree.

Applications would be submitted in response to an open call that would define the following criteria, which may require public consultation or research to assess accurately. They would be selected so as to set the bar high, rather than defining the lowest possible solution, and would be finalized by the program administrator. Criteria include:

- the minimum technical standards for the service, including capacity and scalability requirements;
- service quality standards;
- open third-party access provisions to the facilities, including the requirement for a neutral meet-me point;
- timing, i.e., when facilities are to be implemented;
- price ceilings for key components (wholesale/retail rates, etc.) and the term of such ceilings, set at levels to ensure that the incentives would flow through to third parties (wholesale and retail);
- the areas eligible for funding;[2] and
- any other requirements or eligibility criteria.

The amount of support would be a percentage of capital costs. The percentage of support would be retained at a relatively low level (e.g. 25 percent) so that the funding would not overly favour certain technologies and to ensure that the vested interest of the applicant is maximized for sustainability. The funding could be scaled so that higher cost areas would receive a higher level of funding.

### Application requirements

All applications for funding must:

- be made by an incorporated private sector or public sector party or a joint venture of eligible parties that demonstrates the necessary capability to deploy the proposed infrastructure;

[2] *It is recognized that certain areas may not require additional funding once the transport issue is resolved.*

- include information on how the bid is sustainable;
- demonstrate that any eligibility requirements are met, and commit the party to the service and accountability requirements; and
- commit the party to the service and price requirements outlined in the call.

On successful completion of the evaluation of the submission, the program administrator and the successful applicant would enter a funding agreement to detail their obligations and responsibilities. Specifically, successful applicants would have to commit themselves to wholesale and retail prices at or below those defined in the program for a specific period. Successful applicants would need to provide proof that the facilities and services had been implemented according to the agreement before receiving the funding. In addition, the agreement would detail the repayment schedule, if applicable.

### Model Evaluation

- This model will facilitate the rollout of broadband access within communities, but cannot provide a guarantee that broadband deployment will occur unless the incentive is attractive enough.
- Once transport to communities is addressed, the required support for access is lessened.
- Given the differences between communities and their particular situations, it would be difficult to find the right incentive that would ensure that there would be at least one interested party for every community.
- By creating funding as a lower percentage of capital costs, applicants will have a greater vested interest in ensuring sustainability.
- It is a supply side model that will not provide incentives for usage.
- It is a simple and quick process.

### Definitions

Transport: the delivery of telecommunications to a point of presence or meet-me point in a community. A PoP may be co-located with an institution, but service delivery to that institution is not included in transport.

Access: the distribution of telecommunications within a community from a PoP or meet-me point to selected parties or on a broader scale.

Open third-party access: a situation where:

- third-party service providers can use the underlying facilities to provide services, including services which are similar to those offered by the underlying facilities provider or its affiliate(s);
- the provider of the underlying facilities is required to provide unbundled access to the facilities at published rates, terms and conditions, and in a non-discriminatory fashion, using standardized interconnection interfaces and equipment, and cannot knowingly plan for a limitation in the types of services which could be offered to other service providers or end users; and
- end users could freely choose among different service providers.

## Community Aggregator Model

This model is aimed at developing incentives for the delivery of broadband capability to a point of presence in a community and the delivery of broadband services within a community by investing in a Demand Aggregator.

This program would be delivered in two components.

- Component 1 – assistance for Community Champions or Demand Aggregators,[3] who would pool demand within the community, create partnerships, identify matching funding and make the overall business case for proceeding with the deployment of broadband infrastructure.
- Component 2 – open funding for Demand Aggregators to bring broadband to and/or distribute it within the community or region.[4] Funding presumes completion of the first component and would be available to all who meet the eligibility criteria. Demand Aggregators would carry the burden of proof to demonstrate the need for transport and/or access support. It is recognized that certain communities may require ongoing support, especially in the case of satellite delivery.

### Component 1: Investment in Community Champions or Demand Aggregators

This component provides assistance, including financial assistance where necessary, to Community Champions or Demand Aggregators to allow them to complete the necessary steps in advance of contracting for the deployment of broadband infrastructure. This preliminary function is key to project success, acting as a catalyst to create community networks and establish partnerships.

The Demand Aggregator must be an incorporated private sector or public sector party or a joint venture of eligible parties and will ultimately be responsible for the project. Before the project proceeds to Component 2, the Community Champion or Demand Aggregator will perform the following functions.

- **Develop partnerships:** Identify and form partnerships with key public institution users (e.g. hospitals, schools, libraries, government agencies, social and economic development organizations) and the private sector and identify sources of matching funds. These activities could include creating and launching a public awareness program on the importance of broadband. It is noted that stakeholders have the opportunity to participate in, and be responsible for, a part of the overall project. In this sense, they are participants who can help direct priorities and design. Further, Champions or Aggregators are expected to make their intentions known to possible interested parties in a given region before proceeding to Component 2.
- **Design and execute a market survey:** Before creating a business plan, a comprehensive appreciation of the local environment is required. First, a profile of existing services and current demand would be needed to determine if the community or region is currently underserved. Second, a forecast of future needs (i.e. five years) would be prepared to gauge future requirements and sustainability.
- **Prepare business plan:** To receive any government financial assistance in Component 2, the business plan would have to demonstrate the need for government assistance with the capital cost of the broadband infrastructure, but would also show commercial viability or sustainability without ongoing government financial assistance (except potentially in the case of remote communities and satellite access). The plan would include a description of other sources of financing on a matching basis.

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[3] *It is recognized that the formation of a local Demand Aggregator may result from the efforts of a Community Champion, who may initiate much of the preliminary work. This Community Champion could be a local or provincial government representative or other interested party. In these cases, the Community Champion would be eligible to receive support in component 1. However, the Demand Aggregator would be responsible for the application for funding and accountable to the program administrator in component 2.*

[4] *This model is presented to handle access and transport network components together. However, the model would work equally well for access alone (where a community already had access to transport facilities) or for transport alone. In its current configuration, Demand Aggregators can bundle their needs into one proposal for funding, while the different components could be addressed in two different ways.*

### Support for Community Champions or Demand Aggregators

Recognizing the key role of Community Champions or Demand Aggregators, the program administrator would:

- provide advice;
- develop on-line resources, such as a registry with case studies of various connectivity solutions, business models, financing, costing and request-for-proposal (RFP) models; and
- offer support for feasibility studies to assist Champions in forming networks and preparing business plans.

### Funding for Community Champions or Demand Aggregators

Support for not-for-profit or public sector Community Champions or Demand Aggregators, up to $60 000.[5] This funding would be used by the Community Champions or Demand Aggregators to assist with operational expenses while developing partnerships with the key institutions in the community, as well as assistance with the performance of the market survey and the business plan. Additionally, it may assist the issuance of an RFP for the deployment of broadband infrastructure. Such an organization should demonstrate some sort of public endorsement that it represents the community or communities.

For-profit Community Champions or Demand Aggregators would not be eligible to receive funding for Component 1.

Total funding would be $75 million (assuming approximately 1200 projects at $60 000 each).

### Transition to Component 2

Once the partnership with key institutions has been established, the market survey completed and business plan developed, the Demand Aggregator will begin the necessary steps to see the infrastructure deployed. This will likely involve the issuance of an RFP available to the public through recognized means and the conditional selection of the winning proposal for the provision of the services or infrastructure. Once this is completed, the Demand Aggregator will then be able to apply under Component 2 for government investment from the program administrator. If Demand Aggregators do not require or are not eligible for funding in Component 1 or have already completed the required functions in Component 1, they may proceed directly to the steps outlined below.

It is the responsibility of the Demand Aggregator to:

- issue an RFP in accordance with the guidelines defined by the program administrator and demonstrate its accountable selection process for awarding the winning proposal;
- apply for Component 2 funding (if necessary) from the program administrator; and
- manage implementation and be responsible and accountable for the commitment made in the funding application and to local stakeholders.

Note that the definition of needs and the evaluation of the proposals are done by the Demand Aggregator. As such, the evaluation criteria are not spelled out. However, the program would likely define minimum levels required to be eligible for support. Evaluation criteria used by the Aggregator could include:

- price ceiling and the terms of the price (responses to the RFP would need to demonstrate that prices in the bids were set at levels where the incentives would flow through to third-party users, wholesale and retail);

[5] *Additional funding may be possible with appropriate justification.*

- bandwidth requirements;
- proof of scalability and sustainability; and
- requirement for open third-party access to facilities, including a neutral meet-me point.

### Component 2: Infrastructure Funding

In this component, the program offers direct incentives to Demand Aggregators to bring broadband services to communities (transport) and distribute them (access) within communities, depending on the specific, identified and substantiated need. Demand Aggregators may have to group communities together to achieve the economies required to be sustainable, and as a result, actual implementation is expected to be on a more regional basis, as opposed to community by community. Such clustering may not be feasible for some of Canada's more rural and remote communities, but would still be encouraged where possible. While the funding is based on an open model, duplicate community aggregation is not expected to occur to any great degree, given the requirement to cluster demand and provide evidence of sustainability. The program administrator will act with impartiality and transparency in its evaluation of applications for funding.

### Application Requirements

All applications must clearly substantiate the required funding to bridge the infrastructure gap. The amount of support would depend on rationale and supporting evidence provided by the Demand Aggregator and the evaluation of the program administrator, up to a cap defined in the program.

All applications must provide for open third-party access to the facilities from the outset and participation in the infrastructure provision. To ensure this, proposals for the deployment of terrestrial transport facilities must include surplus capacity beyond the immediate and foreseen needs of the community. However, it is recognized that satellite delivery proposals may only be able to demonstrate minimum service levels.

Applications must include matching funds or in-kind contributions from stakeholders. It is generally anticipated that applications would require such additional support on a 1:1 basis. However, the program administrator would have the flexibility to consider applications that included a lower level of other support, or may require communities to have a higher level of other support, depending on the local circumstances or justification. Partnerships that maximize the benefits to users and the role and risk taking of the private sector will be very important.

The application must indicate how the operation that flows from the bid is sustainable. If it is not, additional aggregation may be required to improve economies and efficiencies. It is anticipated that while applications could be submitted for local areas, clustering of communities within a broader regional area may be required to achieve sustainability.

Applications must include the bids in response to the Demand Aggregator's RFP that were not selected. This is done to ensure fair selection practices.

### Application Evaluation Criteria

*1. Community focus*

- Does the aggregation include key local stakeholders? What is the level of community involvement?

*2. Business case*

- **Assessment of existing technology infrastructure in the community:** Is the community currently underserved?
- **Assessment of demand:** By pooling together local demand, does sufficient demand exist now and into the future to make the proposal attractive with or without public support?
- **Assessment of requested support:** Is the requested level of support substantiated? Are matching funds including in-kind contributions identified?
- **Assessment of sustainability:** Is the proposal sustainable over the long term with the requested support?

*3. Assessment of broadband capability*

- Does the proposal provide sufficient broadband capability to meet current and projected demand?

*4. Performance measurement and accountability*

- Has the applicant committed himself or herself to financial and operational reporting in accordance with contractual requirements?
- Is there a commitment to follow up with user satisfaction surveys?

On approval, the program administrator and the Demand Aggregator will enter a funding agreement. The agreement will detail obligations and responsibilities of the Demand Aggregator as well as support payment (and repayment if applicable) schedules.

## Model Evaluation

- This model will facilitate the rollout of broadband access to communities, but cannot provide a guarantee that broadband will be available in every community unless demand aggregation occurs to a sufficient level to provide incentives for facility building in all communities.
- It allows communities to self-define and to tailor the solution to their own particular circumstances, and is highly adaptable to different communities with different needs.
- It is a demand side, open access support model increasing the likelihood of a strong service marketplace.
- Success is highly dependent on the ability and energy of the local champion.
- The process of identifying Community Champions and assisting them to complete the required tasks could be difficult and complex.
- It could result in different broadband access capabilities for different communities.
- Evaluating and funding numerous applications would be complex.
- Cost and complexity of encouraging, organizing and funding champions is high.

## Definitions

Transport: the delivery of communications to a point of presence or meet-me point in a community. A PoP may be co-located with an institution, but service delivery to that institution is not included in transport.

Access: the distribution of communications within a community from a PoP or meet-me point to selected parties or on a broader scale.

Open third-party access: a situation where

- third-party service providers can use the underlying facilities to provide services, including services which are similar to those offered by the underlying facilities provider or its affiliate(s);
- the provider of the underlying facilities is required to provide unbundled access to the facilities at published rates, terms and conditions, and in a non-discriminatory fashion, using standardized interconnection interfaces and equipment, and cannot knowingly plan for a limitation in the types of services which could be offered to end users or other service providers; and
- end users could freely choose among different service providers.